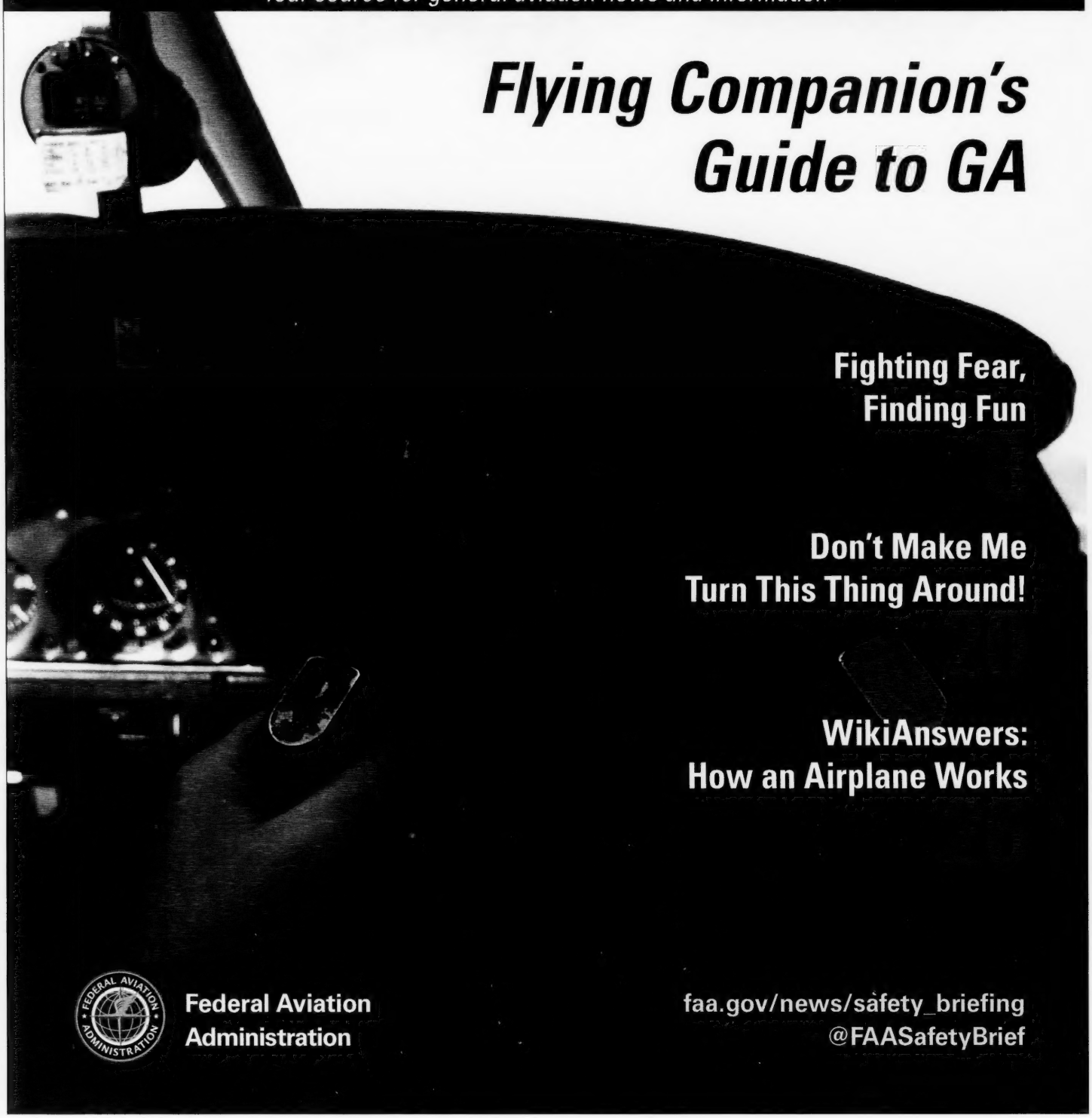
FAA Safety BRIEFING

July/August 2014

Your source for general aviation news and information



Flying Companion's Guide to GA

Fighting Fear, Finding Fun

Don't Make Me Turn This Thing Around!

WikiAnswers: How an Airplane Works

Federal Aviation Administration

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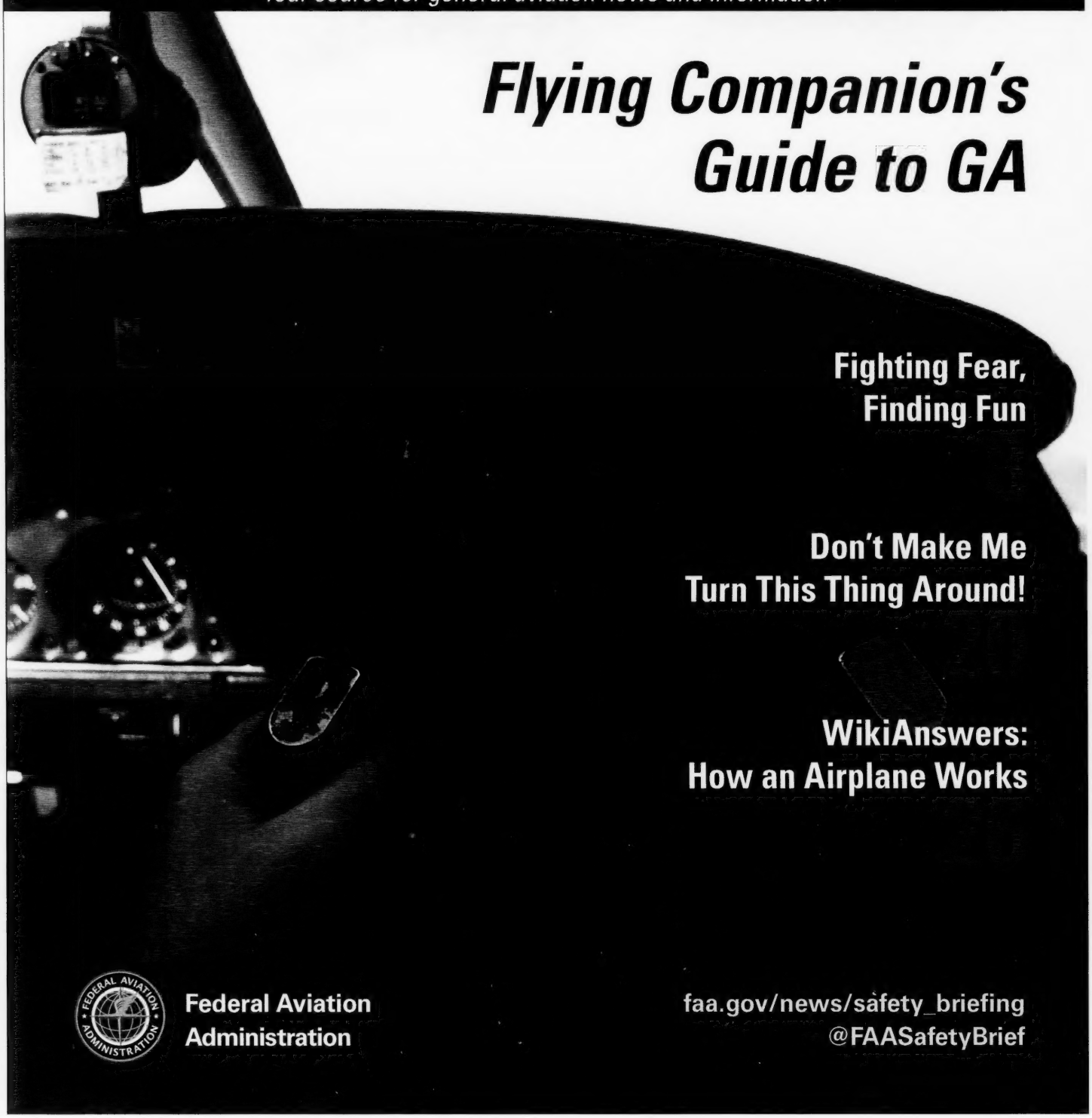

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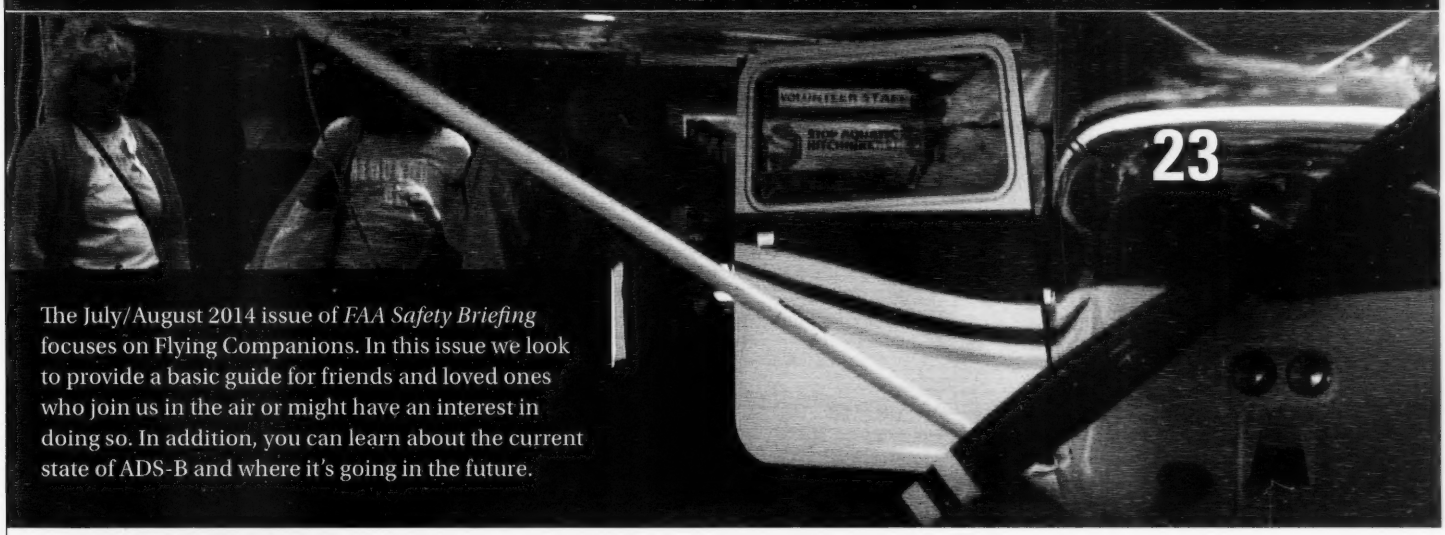
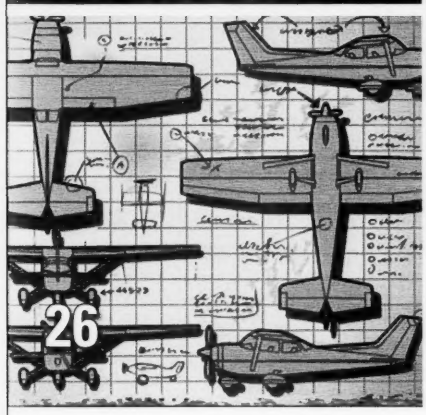


The July/August 2014 issue of *FAA Safety Briefing* focuses on Flying Companions. In this issue we look to provide a basic guide for friends and loved ones who join us in the air or might have an interest in doing so. In addition, you can learn about the current state of ADS-B and where it's going in the future.



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JOHN DUNCAN
DIRECTOR, FLIGHT STANDARDS SERVICE

Come Fly with Me!

Over the years, I've been privileged to own and fly several airplanes. At this writing, I am about to get back into my Piper *Cherokee* for a weekend formation flight clinic with a fellow flier, and the search for the perfect Light Sport Aircraft (at least the one perfect for my needs) is narrowing. It's entirely possible that by the time this article is in your hands, I will have flown the new bird to its new home and figured out how to fit two airplanes into my hangar. I just hope I can keep the *Cherokee* from getting jealous while I devote some quality time to getting acquainted with the new acquisition. But that's another story.

So, can you tell that I'm excited about getting back into the sky, and about launching a new chapter in my lifelong (almost) flying career? Let there be no doubt: I am *very* excited about these very positive developments.

All in the Family

Like most pilots, I am eager to share that excitement with everyone else. Assuming my LSA plans come to fruition, you can count on seeing "baby pictures" of my new airplane in a future issue of *FAA Safety Briefing*. My fellow fliers (some of whom are also FAA colleagues) have already been treated to a progression of iPhone photos of the various LSAs I've considered. They do share my excitement and enthusiasm — not least because the folks at work know I will be a much happier (and probably more pleasant) boss, colleague, and employee when I can once again gain altitude and perspective by spending my spare time in the sky.

Also like most pilots, I am eager for family members to share my enthusiasm for flight and I'm thankful for my wife's support for my aviation avocation. I'm anxious to have family members come fly with me, but I want them to enjoy the experience as much as I do. I don't think that will be an issue for my son. As I wrote in a previous column, I was in the process of training him for his private pilot certificate when medical issues put me on the ground for a lot longer than I had hoped. I am also fortunate that other members of my family are well-accustomed to GA flying, so I don't think it will take long for them to love the new airplane like I do (okay, maybe not *that* much — but I can hope).

A Passenger-Centric Approach

Because I know from experience how important family support is to a pilot, and how much we pilots also yearn for family enthusiasm, I am very pleased that this issue of *FAA Safety Briefing* is devoted to, indeed specifically designed for, the family members and friends who share the skies with us in the wonderful world of GA flying. And, given that EAA AirVenture® is the quintessential family gathering for the aviation community, it is especially fitting to have our annual "Oshkosh issue" focus on our cockpit companions.

I am confident that you and your flying companions will find a wealth of helpful information, advice, and practical suggestions in these pages. In articles such as "Fighting the Fear, Finding the Fun," "WikiAnswers: How Airplanes Work," and "Beeps and Squeaks," we squarely address and, we hope, diminish the fear factor that hobbles too many potential flying companions. In articles such as "PilotSpeak," we seek to demystify some of the jargon and culture associated with aviation. In "You Can't Take All That," we seek to help passengers understand why four seats may not actually accommodate four people, and why we pilots are so fastidious about which bags go where during loading.

Knowing how important family support and enthusiasm are to the pilot, I am very pleased that this issue is devoted to, indeed specifically designed for, the family members and friends who share the skies with us.

We also address pilot and passenger comfort issues in articles like "Don't Make Me Turn This Thing Around," where we offer suggestions to passengers on how they can make GA flying trips more comfortable for everyone. Still another article offers tips on proper planning for that all-important "come fly with me" first flight.

Of course the hope is that your flying companions will eagerly read this issue cover to cover, and take it all to heart. But even if none of your companions can be persuaded to read this passenger-focused issue, I am confident that you will find lots of useful tips and "talking points" to answer or even anticipate their questions. We'll look forward to getting your feedback, and we'll publish any passenger-care tips you care to share in a future issue.

And now, if you'll excuse me, I have an airplane to acquire!

2013 GA Survey Underway

Please help us collect accurate information on aviation activity across the United States, which is used to calculate fatal accident rates for general aviation and Part 135 aircraft. We need to hear from everyone who received the 36th annual General Aviation and Part 135 Activity Survey (GA Survey) invitation in the mail. Even if you did not fly your aircraft in 2013, we still need a completed survey.

The surveys have been sent to approximately 85,000 aircraft owners/operators from the categories of turbine aircraft (turboprops and turbojets), rotorcraft, special light-sport aircraft, aircraft operating on-demand Part 135, aircraft registered in Alaska, and aircraft manufactured since 2008. Because this study is a random sample, only those who receive an invitation can participate. If you have already completed this year's survey, thank you!

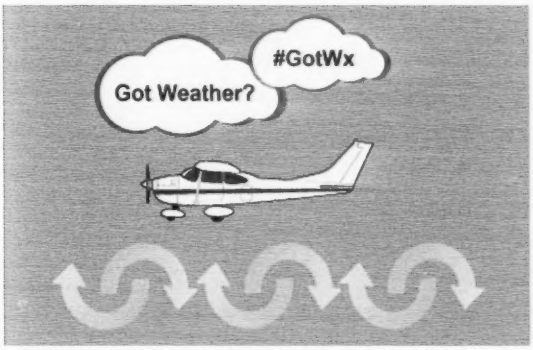
Be assured that your responses are confidential. The information is used only for statistical purposes and will not be released in any form that would reveal an individual participant. Tetra Tech, an independent research firm, is conducting the GA Survey on behalf of the FAA. If you have questions, please contact Tetra Tech toll-free at 1-800-826-1797 or email at infoaviationsurvey@tetratech.com.

MROs Join Voluntary Data Programs

The FAA is pushing to get more maintenance, repair and overhaul (MRO) providers to contribute data to industry-wide risk-based safety programs. Two MRO providers joined the Aviation Safety Information Analysis and Sharing (ASIAS) program recently, which also includes 45 airlines and 24 other corporate, regulatory, and industry organizations. This is part of the agencies risk-based approach to aviation safety.

For public access to some of the data collected through ASIAS, go to www.asias.faa.gov.

"Got Weather?" Campaign Launches: Hashtag #GotWx



The FAA and general aviation groups launched an eight month "Got Weather?" national safety campaign in May to help general aviation (GA) pilots prepare for potential weather challenges they may encounter during the 2014 flying season.

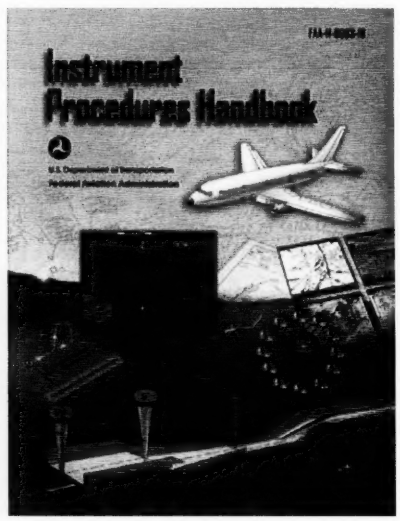
The Got Weather campaign partners are: Aircraft Owners and Pilots Association (AOPA), Aircraft Electronics Association (AEA), Experimental Aircraft Association (EAA), FAA Safety Team, GA Joint Steering Committee, General Aviation Manufacturers Association (GAMA), Helicopter Association International (HAI), National Agricultural Aviation Association (NAAA), National Air Transportation Association (NATA), National Association of State Aviation Officials (NASAO), National Association of Flight Instructors (NAFI), National Business Aircraft Association (NBAA), Soaring Society of America (SSA), Society of Aviation and Flight Educators (SAFE), University Aviation Association (UAA), and U.S. Parachute Association (USPA).

Check out the campaign page with its abundance of resources at http://bit.ly/wxFAA.

New IFR Handbook Released

A new Instrument Procedures Handbook is now available to IFR pilots online, which replaces the 2007 version. The handbook also has specific information

covering runway incursion, land and hold short operations, controlled flight into terrain, and human factors issues. Go to http://1.usa.gov/1lXvpfG to download.



New ATP Knowledge Test for Airplane Multiengine Class Rating

Pursuant to the final rule published in July 2013, requirements are changing for all pilots seeking an ATP certificate with an airplane category multiengine class rating, or an ATP certificate obtained concurrently with an airplane type rating. Beginning on August 1, 2014, all pilots seeking an ATP certificate with a multiengine class rating will be required to complete the ATP Certification Training Program (CTP) prior to taking the ATP knowledge test. This training includes academic and flight simulation training device (FSTD) training. To take the knowledge test for the ATP certificate with an airplane category multiengine class rating after July 31, 2014, the applicant must present a graduation certificate for the ATP CTP. The revised ATP knowledge test for the ATP certificate with an airplane category multiengine class rating will be available on August 1, 2014. A sample version of the test is available at http://www.faa.gov/training_testing/testing/test_questions/media/atm_sample_exam.pdf. For detailed information on the new ATP requirements, please see the Job Aid diagrams at http://www.faa.gov/pilots/training/atp/.

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of Transportation

**Federal Aviation
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Published six times a year, *FAA Safety Briefing*, formerly *FAA Aviation News*, promotes aviation safety by discussing current technical, regulatory, and procedural aspects affecting the safe operation and maintenance of aircraft. Although based on current FAA policy and rule interpretations, all material is advisory or informational in nature and should not be construed to have regulatory effect. Certain details of accidents described herein may have been altered to protect the privacy of those involved.

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CONTACT INFORMATION

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- Writing: Editor, *FAA Safety Briefing*, Federal Aviation Administration, AFS-805, 800 Independence Avenue, SW, Washington, DC 20591
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EAA AirVenture — FAA Safety Center Forums — July 28 — August 3, 2014

	0830—0945	1000—1115	1130—1245	1300—1415	1430—1545	1600—1645
Monday, July 28	***Weather for Controllers and Pilots*** *Dale Wright* *NATCA* *GL0355831*	***Just Because it is Legal Doesn't Mean it is Smart*** *Sarah Rovner* *CFI, FAASTeam Representative* *GL0355832*	***Spatial Disorientation*** *Rogers Shaw* *Civil Medical Institute* *GL0355833*	***What's New in FAA Legal Enforcement*** *Michael McKinley* *FAA Washington DC* *GL0355834*	***Airports, Airspace and Airmanship*** *Wanda Zuege* *CFI, FAASTeam Representative* *GL0355835*	***What Kind of Pilot Runs out of Gas*** *Mike Adams* *Avemco Insurance* *GL0355836*
Tuesday, July 29	***Runway Signage and Avoiding Runway Incursions*** *Jack Vandeventer* *FAASTeam Rep* *GL0355837*	***Ditching and Water Survival*** *Robert Shafer* *U.S. Coast Guard Auxiliary* *GL0355838*	***Mountain Flying Tips*** *Bill Standerfer* *ATP / CFI* *GL0355840*	***Aviation Physiology Human Factors*** *Rogers Shaw* *Civil Medical Institute* *GL0355841*	***Upset Recovery Loss of Control*** *John Dye* *FAASTeam Rep* *GL0355842*	***Take Off and Landings*** *Lynnwood "Woody" Minar* *CFI, FAASTeam Representative* *GL0355843*
Wednesday, July 30	***Common Problems and Solutions FAA Medical Certification*** *Gregory Pinnell, MD* *AME* *GL0355872*	***Flight Services on Steroids*** *Joe Daniele* *Lockheed Martin* *GL0355873*	***The Engine Failure A Survival Guide*** *Lynnwood "Woody" Minar* *FAASTeam Rep* *GL0355874*	***The Kings on Avoiding Unwanted Adventure*** *John & Martha King* *King Schools* *GL0355875*	***Those Daring Men in Their Flying Machines*** *Greg Feith* *Aviation Speakers.com* *GL0355876*	***NextGen for General Aviation*** *Ric Peri* *Aircraft Electronics Association* *GL0355877*
Thursday, July 31	***Plans for Removal of VOR's*** *Rick Massimini & Rick Niles* *MITRE Corp* *GL0355878*	***In Flight Medical Emergencies*** *Dr. Bob Lewis* *FAASTeam Representative* *GL0355879*	***General Aviation Awards Presentations 2014***	***Was it Really Worth It*** *Greg Feith* *AviationSpeakers.com* *GL0355880*	***Accident Case Study Part 1*** *Andy Miller* *AOPA Air Safety Institute* *GL0355881*	***Hot Aeromedical Issues!*** *Michael A. Berry, MD* *Deputy, Federal Air Surgeon* *GL0355882*
Friday, August 1	***Interceptor Operations TFRs and You*** *Kevin Roethe* *NORAD* *Peterson AFB, CO* *GL0355883*	***FAR Part 23 Proposed Changes and Effect on General Aviation*** *Ric Peri* *Aircraft Electronic Association* *GL0355884*	***Law Enforcement use of Unmanned Aerial Vehicles*** *Alan Frazier* *University of North Dakota* *GL0355885*	***Approaches That Can Kill-VFR*** *Ray Heyde* *FAASTeam Representative* *GL0355887*	***Approaches That Can Kill- IFR*** *Ray Heyde* *FAASTeam Representative* *GL0355891*	***Accident Case Study Part 2*** *Andy Miller* *AOPA Air Safety Institute* *GL0355894*
Saturday, August 2	***Avoiding Pilot Deviations & Runway Incursions*** *Peg Ballou* *Ballou Skies Aviation* *GL0355898*	***Weather Challenge*** *Andy Miller* *AOPA Air Safety Institute* *GL0355901*	***Thunderstorm Avoidance Using Airborne NEXRAD Radar*** *David A. Strahle M.D. CFI* *GL0355902*	***Is Your Airplane Airworthy*** *Larry Bothe* *Master CFI, DPE* *GL0355903*	***Weather Risk Management*** *Jeff Taylor* *Wisconsin DOT* *GL0355906*	***Mechanic And Owner Responsibilities For Maintenance Records*** *Terry Michmerhuizen* *Western Michigan University* *GL0355907*
Sunday, August 3	Aviation Safety Videos Shown All Day Long—Come Join Your Fellow Pilots For a Movie or Two! (Times listed here are approximate start times) **0830—Friendly Flight Paths (GL0355908)** **0905—Fuel Awareness (GL0355909)** **0940—Midair Collision Avoidance (GL0355910)** **1025—Avoiding Spatial Disorientation (GL0355911)** **1105—Tips on Mountain Flying (GL0355912)** **1145—Pilot Operations at NonTowered Airports (GL0355913)** **1235—Evaluating In-Flight Weather (GL0355914)** **1320—Single Pilot IFR (GL0355915)**					

AppropriateAMT / WINGS credit will apply to events by using associated select #GL0355XXX listed in each box above.

FAA Forum & FAA Exhibit Hall Open Daily at 8:30 a.m.
Schedule is subject to change; for updates check the QR code or go to: **https://docs.google.com/document/d/1BFvLT3eLX7F2-JJ910OLNEUA82sH-P6uTshqq9Nq8yY/edit/usp=sharing**

Rev-1

JAMES FRASER, M.D
FEDERAL AIR SURGEON

Seasons of Discontent

For many people, myself included, seasonal allergies are an unpleasant fact of life. Some people get them in the spring, others in the fall, and some unfortunate souls at both times of year. As we enter the brief respite between potential allergy seasons, I wanted to take a moment to discuss a concerning and persistent trend we are seeing in accident data. A few years ago my predecessor, Dr. Tilton, wrote about the dangers of flying while taking, or shortly after taking, certain medications specific to combating allergies. During the General Aviation Joint Steering Committee (GAJSC) review of loss of control accident data, the working group evaluated a random sample of 90 accidents occurring between 2001 and 2010. About 12 percent of these accident investigations found medications prohibited by the FAA as causal or contributory to the mishap. This seems to be a persistent problem for us.

The Nature of the Problem

The main offender in this case is diphenhydramine, commonly known by the trade name *Benadryl*®, but also found in many other medications. Diphenhydramine tends to impair what we call the "executive functions" of the brain, such as the ability to pay attention, planning, multi-tasking, memory, and problem solving. These functions are so critical to flying that any level of impairment to them is a major safety concern.

Diphenhydramine is also a key component of many, if not most, "PM" labeled medications and standalone sleep aids. Take a stroll down the over the counter (OTC) medication aisle of your local pharmacy or grocery store and read the ingredients label on the above mentioned medications to get an idea of the scale of the issue faced by pilots. Use of diphenhydramine is widespread. This isn't to say diphenhydramine is a bad drug — it's not — it is just that you need to be aware of its side effects and some of its primary uses beyond allergy relief. Simply put, you wouldn't take a sleeping pill right before you got in the cockpit, so why are you taking an allergy pill that is also used as a sedative?

So what do you do if you are still stricken by those allergies? The best strategy is to find an alternative medication, which we will discuss in a moment. If you can't find an alternative, you need to know how long to ground yourself before you're safe to fly. Our current guidance is to wait until five times the maximum dosing interval has elapsed. In the case of a medication that is directed to be taken every four to six hours, that would be 30 hours after the last dose (5x6=30).

A Different Way Forward

If you're anything like me, the idea of facing seasonal allergies without some form of medication is a daunting one. This doesn't mean you have to choose between a season-long grounding and allergy relief, however. There are non-drowsy alternatives to diphenhydramine. One is loratadine (common trade names: *Claritin*®, *Alavert*®, *Wal-itin*®, and *Agistam*®), which work well for me. Other options include fexifenadine (*Allegra*®) and desloratadine (*Clarinex*®). These alternatives could offer better, non-impairing, options to treat your allergies. Still, we all have differing reactions to different drugs and different drug allergies. So please consult your personal physician or AME for recommendations in your specific case. Please help us spread the word on this topic. It remains a persistent problem for all of us (FAA, stakeholder groups, and the GA public), but it is a very solvable problem if we can get this message out. If you have any questions, don't hesitate to contact your AME or Regional Flight Surgeon.

Simply put, you wouldn't take a sleeping pill right before you got in the cockpit, so why are you taking an allergy pill that is also used as a sedative?

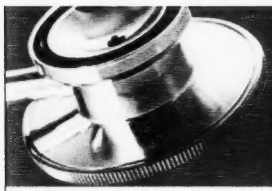
James Fraser received a B.A., M.D., and M.P.H. from the University of Oklahoma. He completed a thirty year Navy career and retired as a Captain (O6) in January 2004. He is certified in the specialties of preventive medicine (aerospace medicine) and family practice. He is a Fellow of the Aerospace Medical Association and the American Academy of Family Practice.

For More information:

Pilot Safety Brochure: Medications and Flying
www.faa.gov/pilots/safety/pilotsafetybrochures/media/Meds_brochure.pdf

IM SAFE Checklist Airman Information Manual (Chapter 8): www.faa.gov/air_traffic/publications/atpubs/aim/aim0801.html

Drugs and Alcohol in Civil Aviation Accident Pilot Fatalities 2004-2008:
www.faa.gov/data_research/research/med_humanfacs/oamtechreports/2010s/media/201113.pdf



Ask Medical Certification

COURTNEY SCOTT, D.O.
MANAGER, AEROSPACE MEDICAL
CERTIFICATION DIVISION

Q1. I have not flown in over five years and counting. When personal circumstances allow, I plan to get back into it. Of course my last medical has expired so when I apply for a medical, will it be considered a renewal, or will it be as if I've never had one before?

A1. The short answer is that each new exam is just that — new. If you were on a special issuance, this would vary according to what might be needed to continue the special issuance, but for the exam itself, it is not a "renewal."

Q2. Since my last medical, I have had LASIK eye surgery. I accumulated the proper forms at the time, expecting to continue to renew my medical on a regular basis. However, I have not and it has lapsed. Now, the paperwork is no longer readily available. Would I need to produce any kind of proof that my vision is fine (and if so, what would that be?) or would just getting the medical process restarted be considered suitable for that purpose? Is any kind of post-surgery documentation even necessary at this point as long as I can demonstrate adequate eyesight?

Send your questions to SafetyBriefing@faa.gov. We'll forward them to the Aerospace Medical Certification Division without your name and publish the answer in an upcoming issue.

A2. The policy for any kind of refractive surgery (including LASIK) is that after two years, the airman is only required to meet visual standards. If the surgery occurred less than two years ago, we need an FAA Form 8500-7, Report of Eye Evaluation, filled out by your treating eye physician.

Editor's note: if you want to learn even more about the LASIK process, check out "The Eyes Have It" in the January/February 2013 edition of FAA Safety Briefing.

Q3. My 2nd class was issued six months ago. Two weeks ago I was diagnosed as having had a minor stroke. I have no intent to fly other than as a CFI, non PIC. Do I need to report this to my DPE? Is there an automatic grounding period before I can request medical reinstatement? Would I be eligible to fly LSA aircraft?

A3. In aeromedical certification we interpret a stroke, even a minor stroke, as a condition that would be governed by Title 14 Code of Federal Regulations (14 CFR), section 61.53. You should not fly until cleared by the proper authorities in the office of the Federal Air Surgeon. We are unaware of any requirement to report the condition to a pilot examiner; however, if you do fly, we believe you are in violation of the regulations as stated above. The medical policy at present is that an airman who sustains a stroke has a minimum two-year waiting period for re-application. If you apply prior to that time, you will be denied. If you are in a denied status, you are not eligible to fly LSA. The medical reasons behind this relate strongly to the fact that the highest risk factor for another stroke is having had a prior stroke. There are some extenuating circumstances. If a treatable cause for the stroke is identified, and if the treatment appears to be appropriate, the waiting period can be shorter.

Q4. Are any special approvals required after cataract surgery?

A4. Cataract surgery requires a minimum one month waiting time after surgery. Then the airman should undergo a thorough vision exam from the treating physician, and the physician should fill out an FAA Form 8500-7, Report of Eye Evaluation. If the airman meets visual standards at that time, the airman is eligible to resume flight; i.e., special issuance is not required. If there are any questions, the airman is advised to consult with his or her aviation medical examiner.

Q5. I have a Third Class Medical question. Can you get a special issuance if one eye goes beyond the 20/40 if the other eye is 20/40 or lower and all other aspects of the eyes are acceptable? Say 20/50 or 20/60?

A5. There is no simple answer to this question, primarily because the real issue is about why the vision is deteriorating. If there is an underlying progressive disease, such as glaucoma or macular degeneration, then special issuance for the disease process is required. If the vision does not meet the minimum required standards, but the airman is well adapted to the substandard vision, it might be possible to try to obtain a Statement of Demonstrated Ability (SODA). SODAs are specifically designed for conditions that are medically stable. In order to obtain a SODA, the underlying condition must be stable and the airman must pass a Medical Flight Test with a Flight Standards inspector.

Courtney Scott, D.O., M.P.H., is the Manager of Aerospace Medical Certification Division in Oklahoma City, Okla. He is board certified in aerospace medicine and has extensive practice experience in civilian and both military and non-military government settings.

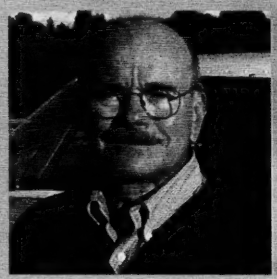
Top GA Aviation Professionals Named

The General Aviation Awards Program — started in 1963 — is a cooperative effort between the FAA and 38 GA industry partners. Each year it recognizes aviation professionals for their contributions in the fields of aviation, education, and flight safety. Applicants are evaluated against at least four required metrics: professional involvement, *pro bono* service to the aviation community, continuing education, and the strength of three letters of recommendation.

The national winners are officially recognized during EAA AirVenture each year in July, which includes an all-expenses-paid trip to the world's greatest aviation celebration in Oshkosh, Wisconsin. For more information on this year's award winners, go to www.generalaviationawards.org.

Howard William Wolvington

Issaquah, Washington
National Certificated Flight Instructor (CFI) of the Year



Howard works as an independent CFI with the Boeing Employees Flying Association (BEFA) at the Renton Municipal Airport, and with private clients at airports in the Seattle area. He holds an ATP certificate and has more than 13,000 hours of flight time. As a Gold Seal CFI with instrument and multiengine ratings, he has given more than 10,000 hours of flight instruction and 8,000 hours of ground instruction.

David Brian Kocak

Guilford, Connecticut
National Avionics Technician of the Year

David serves as the avionics service manager, installation manager, and inspector at V.I.P. Avionics at Hartford-Brainard Airport, where he has been employed for the past 16 years. He holds a repairman's certificate with inspection authority and a Federal Communications Commission General Radio Telephone Operator license.

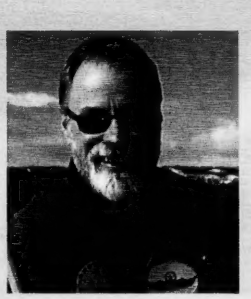
Max Loyd Burnette

Rockvale, Tennessee
National Aviation Maintenance Technician (AMT) of the Year

Max is semi-retired after 59 years in aircraft maintenance and 29 years as an A&P mechanic. He began flying as a hobby in 1956 and remains an active pilot. In his semi-retirement, Max is currently doing a complete restoration of a 1941 Piper J-5 Cub Cruiser. He has been a member of EAA and AOPA since 1986, and he actively participates with EAA Chapter 1326 in Shelbyville, as a volunteer pilot in the EAA Young Eagles program.

Richard Loren Stowell, Jr.

McCall, Idaho
National FAA Safety Team (FAASTeam) Representative of the Year



Richard is a full-time aviation educator specializing in spin, emergency maneuver, and aerobatic training since 1987. He owns and operates Rich Stowell Consulting and is an independent flight instructor, author, and speaker. Richard has given more than 8,700 hours of flight instruction and performed more than 33,400 spins in 215 spin-approved aircraft. He has conducted training clinics and seminars in 27 States and four foreign countries.

Fighting the Fear, Finding the FUN!

The Cockpit Companion's Guide to GA Flying Enjoyment

BY SUSAN PARSON

So, there is this general aviation (GA) pilot in your life. He or she practically bubbles over with enthusiasm. Your pilot virtually disappears into flight training or just-for-fun flying for hours regularly. Large sums of money vanish from the checkbook. A seemingly endless collection of aviation-related gadgets and devices accumulates in the house. Your pilot speaks an odd jargon-y language punctuated by self-generated airplane noises and extravagant hand gestures.

You initially think (or hope) it's just a phase. You might even experience a sort of five-stage progression through denial, anger, bargaining, and resignation before reaching a level of acceptance. At that point, you begin to adjust to these quirky, even amusing, personality changes. You accommodate the new habits. You find space for all the gadgets. You occasionally (if nervously) go flying on a few of the recreational jaunts. And, if your pilot uses the airplane for transportation, you can sorta, kinda see how, weather permitting, a couple of hours in a GA airplane can beat lots of hours fighting the ground-bound automobile traffic.

But now your pilot wants *you* to go the extra mile. With fervor akin to that of an ardent preacher, your pilot wants to convert you from mere acceptance, to avid enthusiasm, and maybe even some level of participation. You aren't so sure about flight training, but you eventually realize that your pilot's aviation addiction is not a passing phase. You also realize that while you may never share the addiction or reach your pilot's extreme level of "gotta-fly" enthusiasm, there *are* benefits to vanquishing the fear and finding the fun.

If even some of this scenario sounds familiar, this article is for you. Read on!

Safety First

As an enthusiastic presenter of "cockpit companion" seminars over the years, I start by addressing several key points.

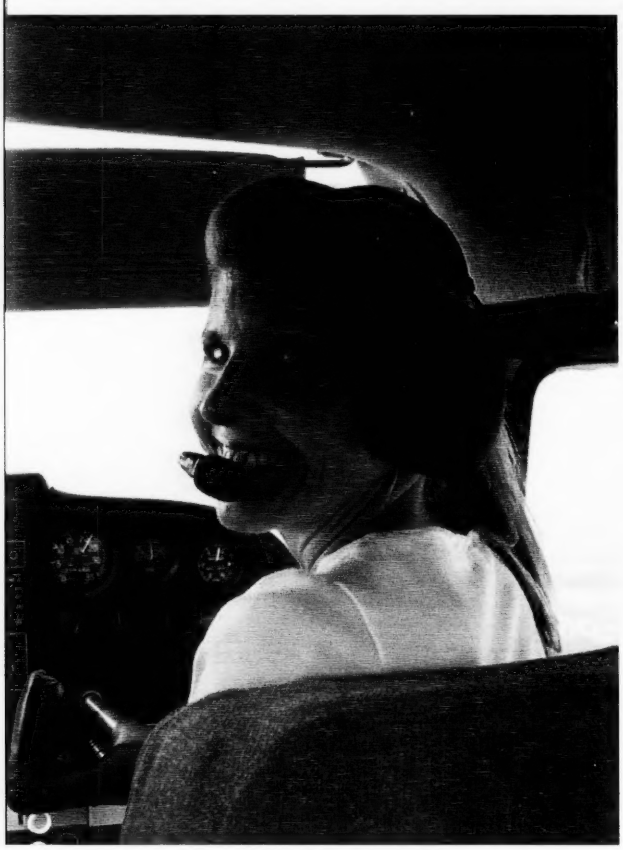
First, GA flying is not a death-defying activity undertaken by risk-loving daredevils. Yes, there is risk. And yes, GA pilots can certainly do a better job of managing and mitigating that risk. More on that point, and how you can help, elsewhere in this issue. Certification and maintenance requirements for both GA aircraft and GA pilots are a lot more demanding than most people realize. Certificated aircraft (as opposed

to amateur-built) must meet stringent safety requirements, and they are subject to thorough inspections on at least an annual basis (hence the term "annual"). GA airplanes are also subject to a specific, structured preflight inspection that the pilot performs before each flight.

On the human side, most certificated pilots are intelligent, rational, and accomplished people — not daredevils. They get a lot more training than licensed auto drivers in order to earn even the most basic flying credentials, and then there are a number of recurrency requirements a pilot must meet in order to retain flying privileges. All of these factors contribute to safety.

Second, there is *no way* I can teach you to land the airplane in an emergency situation (e.g., pilot incapacitation) in just a two-hour ground session or from a magazine article. To accomplish this, I strongly recommend investing in a couple of hours with an instructor (*NOT* your pilot companion, even if he or she has flight instructor credentials!) to get some hands-on experience with manipulating the controls in-flight and landing the airplane from the right seat. Just two hours of practice could go a long way toward fighting any fears and, better yet, increasing your confidence and enjoyment of the experience.

Third, chances are very good that you will never even need those skills as a right-seat cockpit companion. Pilot incapacitation stories make headlines primarily because they are unusual occurrences — not because they are commonplace events.



Fourth, one practical thing you *can* do to reduce fear, increase confidence, and enhance enjoyment of the GA flying experience is to learn a little more about what the pilot does, how the plane works, and how you can participate — both in normal conditions, and in the unlikely event of an emergency situation. So here we go.

What's the Pilot Doing, and What *IS* All that Stuff in the Panel?

You'll find a great tour of the airplane's structural anatomy in Sabrina Woods' "WikiAnswers" article. The external surfaces — wings, fuselage, powerplant/propeller, and overall structure — contribute to developing what pilots know as the Four Forces of Flight: lift, weight, thrust, and drag. In a nutshell, the pilot's job is to use the cockpit controls — yoke, throttle, and rudder pedals — as well as the array of cockpit panel instruments, to manage, monitor, and direct these four forces of flight.

The collection of controls and instruments can look very intimidating, but we can break them down into three categories that correspond to the three priorities every pilot knows: Aviate — Navigate — Communicate.

The collection of controls and instruments can look very intimidating, but we can break them down into three categories that correspond to the three priorities that every pilot knows: Aviate - Navigate - Communicate.

Aviate: The top priority — *always* — is to aviate. That means fly the airplane by using the flight controls and flight instruments to direct the airplane's attitude, airspeed, and altitude. The instruments directly in front of the pilot provide important information on how well the pilot is doing with respect to basic aircraft control. Starting from the top left and moving clockwise, the pilot gets information on airspeed, attitude with relation to the horizon, altitude, vertical speed and rate, magnetic heading, and turns and coordination (i.e., is the fuselage aligned with the direction of flight). Though presented a bit differently, the same information (and much more) is available to the pilot on the "primary flight display" of a so-called "glass cockpit" aircraft. The pilot uses controls such as the throttle and panel instruments to set engine power and monitor engine performance.

Navigate: The next priority is to navigate, which means pointing the aircraft in the direction you want it to go. This task begins with knowing where you are right now. In order to navigate, the pilot can use a combination of instruments that include the magnetic compass, the heading indicator, and navigation instruments such as the VHF omnidirectional radio range (VOR)—

sometimes combined with the heading indicator to form an instrument called the horizontal situation indicator, or HSI. In many airplanes, today's pilots also have the benefit of GPS-driven moving map navigators. In newer glass cockpit airplanes, pilots can get an unprecedented range of navigation-related information — including weather, terrain, and obstacles — from a multi-function display (MFD).

Communicate: The final priority is to use the radios to communicate as necessary and appropriate. In some cases, the pilot makes and receives transmissions from air traffic control (ATC) during all phases of flight. In other cases, the pilot might communicate with ATC only when approaching an airport with an operating control tower. When operating around non-towered airports, the pilot makes radio calls on the published Common Traffic Advisory Frequency (CTAF) and uses radio calls from other pilots to remain clear of other traffic.

There are lots of ways that a right seat passenger can do to help the pilot manage flight duties

What Can I Do to Help?

There are lots of ways that a right seat passenger can help the pilot manage flight duties. Let's look at a few.

- *Watch for traffic*: The sky is a big place, but there can be a lot of airplanes enjoying it at the same time — and of course airplanes converge in the vicinity of an airport. One of the most helpful things a passenger can do is to watch for other airplanes and point them out to the pilot. If the pilot is monitoring an ATC frequency, you can also listen to traffic calls that the controller makes and try to make visual contact. Controllers use a combination of clock positions, distance, and altitude to convey the other aircraft's position relative to yours. For instance: "traffic twelve o'clock, three miles, 5,000 feet" tells you that the other airplane is three miles straight ahead of you. If you know that your airplane's altitude is 4,000 feet, the other aircraft will be above the horizon relative to your position.
- *Read checklists*: Pilots at every level make extensive use of checklists to ensure that all necessary tasks are completed at the right time, and in the correct sequence. One way you can help is to read checklists for the pilot, and then watch to ensure that he or she completes the required task. In addition to being a big help to the pilot, performing this task will provide a big boost to your knowledge of the aircraft. Ask your pilot companion to let you run the checklists, starting with the preflight inspection. If the pilot forgets to call for a checklist (e.g., after takeoff checklist), you can provide a gentle reminder by asking whether he or she is ready for it. Another important checklist is the passenger briefing checklist. Turn to this issue's Checklist department for details on items to cover.
- *Monitor progress*: Even in the era of moving map navigators, there is no substitute for human situational and positional awareness. Learn to read paper charts, tablet navigation apps, or panel-mounted moving map navigators. You should be able to determine where you are, and where you are going. Follow the progress of the flight, and make verbal callouts when you see the aircraft crossing a named navigational point. For example: "Crossing Casanova; next waypoint is WITTO intersection." Especially on a flight where ATC gives instructions, it is helpful to keep a written log of assigned headings, altitudes, and radio frequencies. Another way to monitor flight progress is to learn to read key instruments (e.g., airspeed indicator, attitude indicator, altimeter, heading indictor, RPM and/or manifold pressure gauges) and pay attention in order to develop a sense of the gauge positions and settings used for various phases of flight. Though you might find it useful to write down specific numbers and settings, a well-developed sense of what looks right from the right seat is more practical than attempting to read specific numbers on the left side of the panel. Finally, start paying attention to the sight picture for takeoff, climb, cruise, descent, and approach to landing. You will soon develop a sense of what looks normal and right, and you can call the pilot's attention to anything that strikes you as abnormal or wrong.
- *Set/monitor radios*: You can be a big help to the pilot if you learn how to set and change radio frequencies, which can change frequently throughout a flight. And, while aviation radio chatter may initially sound like a foreign language, careful attention will help you pick out words and phrases — starting with your airplane's call sign, which is a combination of make/model and tail number (e.g., Skylane 1234Z). You can also learn to set the aircraft's ATC-assigned transponder code, which allows ATC to specifically identify and track your individual aircraft on radar. Finally, learn to perform basic functions on the installed or hand-held moving map navigator(s).

What Do I Do in An Emergency?

As in any tough situation, advance preparation counts for a lot. Just remember your priorities:

- *Aviate* – use flight controls and instruments to control attitude, airspeed, and altitude. Even a little bit of hands-on right seat flying with a qualified instructor will be a great investment if you ever find yourself in a bind.
- *Navigate* – use the navigation instruments to help you determine where to go and get the aircraft pointed in that direction. That's why it's a great idea to learn basic functions now and practice them on every flight with your pilot companion. If nothing else, be sure you know how to set the moving map navigator to take you "direct to" the nearest airport.
- *Communicate* – set the communications radio to 121.5 – the "911 of the sky" – and make a mayday call. Set the transponder to code 7700, which makes your aircraft very visible on the ATC radar screen. Again, learning and practicing basic functions on routine flights will ease your workload (and your stress level) in the unlikely event of a pilot incapacitation emergency.

What Do I Do Now?

Take the time to learn some of the skills described in this article. Make a point of using every right seat flying opportunity to pay attention, learn, and practice these skills. Ideally, you will spend a couple of hours getting hands-on experience handling the controls from the right seat. These practices will stand you in good stead in the unlikely event that you might have to land the airplane on your own.

Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. *She is an active general aviation pilot and flight instructor.*

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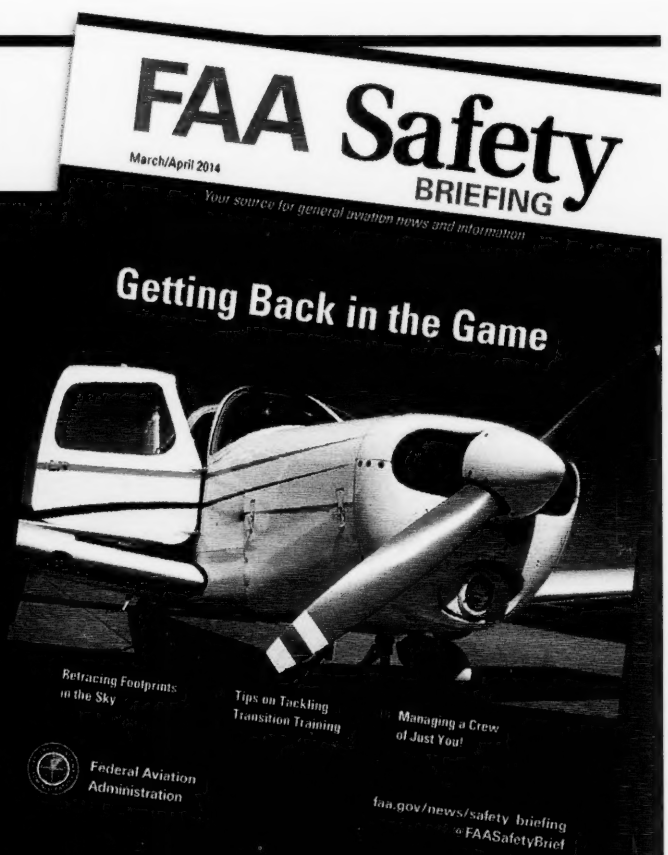
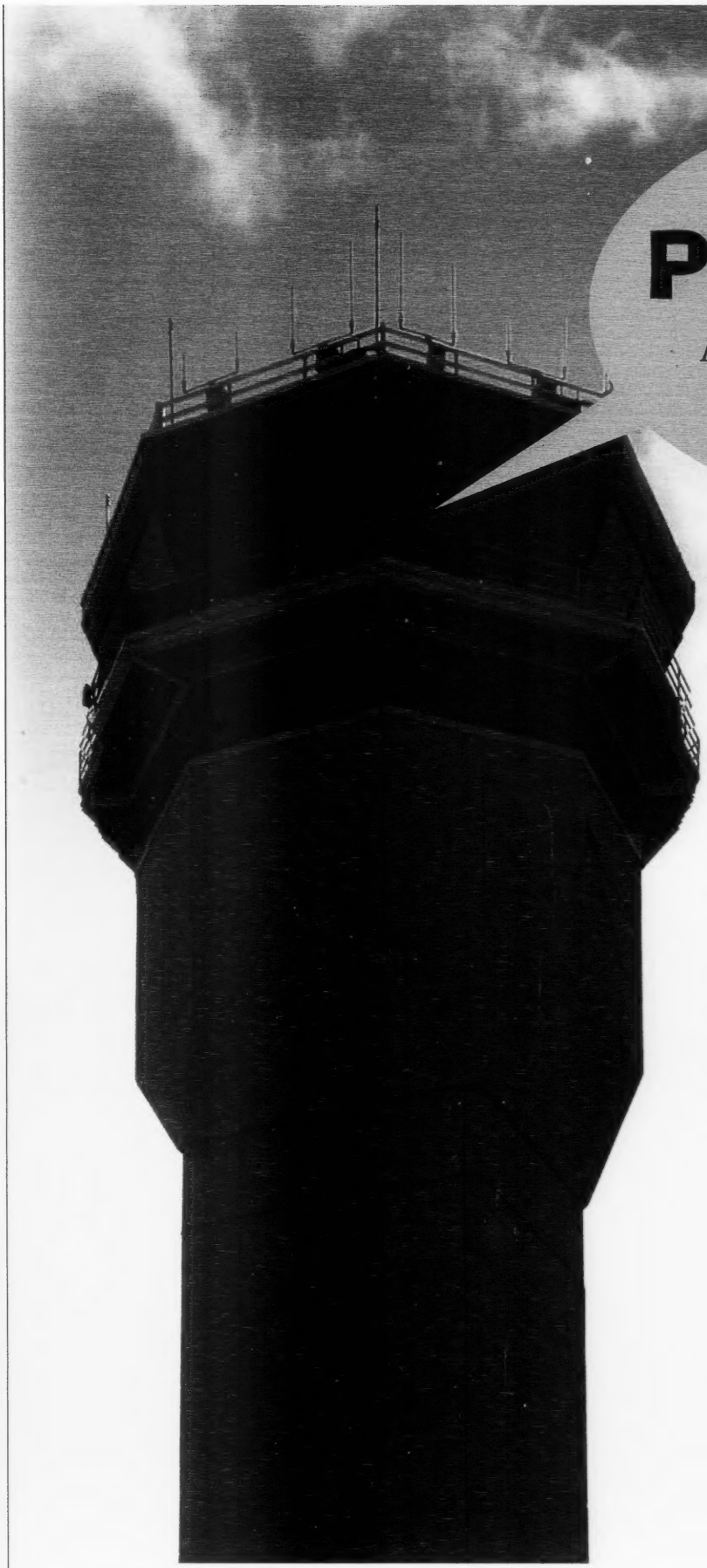




PilotSpeak

A Beginner's Guide to the Aviation Lexicon

BY SUSAN PARSON

I've always loved languages. In addition to English, I have studied French, Spanish, Bengali, and several dialects of "Guy." But on the day of my first flight lesson, none of that linguistic experience helped me make sense of the static-filled gibberish flowing from the little Cessna's radio. It took a bit of time, effort, and practice, but eventually I got it. If you are a regular GA aircraft passenger who would like to know more about what's going on over the radio, here are a few tips that can help you decipher PilotSpeak.

The Ws

For safety reasons, the language of aviation is highly precise in both its "grammar" (structure) and its vocabulary. In fact, there is a dictionary of aviation terms and phrases called the Pilot/Controller Glossary to ensure that pilots and controllers assign the same meaning to the same words and phrases.

When a pilot makes a transmission, he or she follows a specific structure. The script calls for the pilot to say something like: "Phoenix Approach, Skyhawk 1357T, twenty miles west at five thousand five-hundred feet, landing Falcon Field." Now let's look at the individual elements:

- **W**hom you are calling. "Phoenix Approach" or "Richmond Tower"
- **W**ho you are, using the aircraft's make, model, and tail number: "*Skyhawk* 1359 Tango"
- **W**here you are: "twenty miles west" at "5,500 feet" (read from the altimeter)
- **W**hat you want to do: "landing Falcon Field."

The controller will use a similar sequence to respond:

- **W**hom ATC is calling: "*Skyhawk* 1359 Tango"
- **W**ho is calling you: "Phoenix Approach"
- **W**here ATC thinks you are (sometimes based on radar): "radar contact, twenty miles west "5,500 feet"
- **W**hat ATC wants you to do: "maintain present heading; descend and maintain 3,500 feet."

Depending on the situation, there are obviously a lot of variations in terms of words and phrases that pilots and controllers use. Still, the structural sequence is the same.

The Alphabet

To help avoid confusion with similar sounding consonants and numbers, in March 1956 the International Civil Aviation Organization (ICAO) adopted a standard phonetic alphabet for aviation use:

Alpha, Bravo, Charlie, Delta, Echo, Foxtrot, Golf, Hotel, India, Juliett, Kilo, Lima, Mike, November, Oscar, Papa, Quebec, Romeo, Sierra, Tango, Uniform, Victor, Whiskey, X-ray, Yankee, Zulu.

PilotSpeak numbers are pronounced mostly the same as they are in regular English, with just a few exceptions:

- The number three (3) becomes "tree."
- The number five (5) becomes "fife."
- The number nine (9) becomes "niner."

Using the made-up tail number in the previous example, both the pilot and the controller will pronounce the airplane's call sign as: "one-tree-fife-niner Tango." You may or may not hear the call sign start with "November," but if you look at the tail number of any U.S.-registered aircraft, you will see that it begins with "N" — "November." Other countries use a different starting letter (or a combination of letters and numbers) to denote an aircraft on their registry.

Useful Words & Phrases

Now let's decode some of the words and phrases you might hear:

ATIS (Automatic Terminal Information Service) is recorded information on current weather and airport information, such as runways in use. Each successive ATIS recording has an alpha-numeric designator to distinguish it from previous ones. For example, "ATIS information Foxtrot is current."

Squawk: This word refers to the aircraft's transponder code, which can be either a standard code (1200 for visual flight rules — VFR) or a discrete code assigned by ATC. Squawk can be a noun ("say assigned squawk"), and adjective ("squawk code is 2345"), or a verb ("squawk 5423").

Mayday: Hopefully you will never have to use this one, but "Mayday" means emergency. In case you're wondering, the word is a corruption of the French term for "help me" (m'aidez).

Who's Roger?!

Last but not least ... ever wonder why aviators say "Roger?" A very plausible explanation arises from aviation's early days, when the industry adopted customs, procedures, and terms from established industries like the telegraph business. Given the uncertain quality and reliability of Morse code telegraph transmissions, the receiver would transmit a single letter "R" — upon successful receipt of a message to signify that "I have received and understood your transmission."

For safety reasons, the language of aviation is highly precise in both its "grammar" (structure) and its vocabulary.

Early aviators needed a similar protocol. As it was not possible to transmit a Morse-coded "R," they did the next best thing by transmitting the word "Roger," which was at that time the spelling ("phonetic") alphabet version of the letter "R." Then, as now, it was simply an acknowledgement that "I have received and understood your last transmission." So be grateful that aviation adopted this practice before the phonetic alphabet changed from "Roger" to "Romeo!"

Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. *She is an active general aviation pilot and flight instructor.*

Photo by Susan Parson

The Voice of Reason

Partnering for Safety and Risk Management

BY SUSAN PARSON

Here's one of the most poorly-kept secrets in aviation:

Pilots. Have. Egos. *Big* egos.

That's because learning to fly takes money, and it takes time. It also takes dedication, hard work (lots of it), and plain ol' stubborn determination to succeed. Individuals who persevere long enough to earn that first pilot certificate are understandably proud of this achievement. Most of us are also proud (okay, maybe even a little smug) to be members of a surprisingly small and thus "exclusive" group.

The problem is that pilot pride can sometimes interfere with good judgment and good decisions, especially if there is an audience of potential passengers involved. Pilots don't want to appear dumb. We don't want to be (or appear to be) cowards. We don't want to disappoint partners and other passengers who have agreed — some grudgingly — to put their lives in our hands by occupying a seat in the airplane. We don't want to be (or appear to be) incapable, unable, or unworthy.

Most of all, we don't want to say "no." Human nature being what it is, at least in the immediate timeframe, it is so much easier for a pilot with passengers to say "yes" regardless of weather and safety factors that make "no" the wiser choice. So here's what I tell pilots who attend my safety seminars and pilot partners who come to right-seat courses: The day a pilot truly becomes pilot-in-command is the day that he or she says "no" to a flight that somebody in the group really, really, REALLY wants to make.

So what can a GA pilot's right seat companion do to help? Plenty! It starts with using a structured way to identify hazards, and reduce their ability to pose a risk to flight safety. In the next paragraph is the "PAVE" hazard and risk assessment framework that many pilots use to evaluate circumstances for a particular flight. By encouraging consistent use of such tools for both flight analysis and the so-called "go/no-go" and "continue/divert" decision-making processes, you can help your pilot save face — and, most importantly, you can help save lives.

PAVE the Way to Safety

- **Pilot/People:** The first item in the PAVE hazard and risk assessment tool is *P*, which can refer not just to the *pilot*, but also to *passengers* and other *people* involved in the flight. This item should remind the pilot to review his or her readiness for the flight on several dimensions. These include total experience, recent experience, proficiency, and legal requirements (e.g., currency requirements for night, instrument flight, passenger-carrying operations). Other dimensions include the pilot's physical and emotional condition. A pilot's spouse or significant other can be especially helpful in this area, because who is better situated to know when something just isn't right?
- **Aircraft:** The *A* element of PAVE reminds the pilot to evaluate hazards and risk factors associated with the *aircraft*. These include determining fuel and fuel reserve requirements, the mechanical condition of the aircraft and its equipment, and expected aircraft performance (e.g., takeoff and landing distances) for conditions on the day of the flight. The *A* also reminds the pilot to consider his or her level of experience in the specific type of aircraft and its equipment. Once a pilot companion is more comfortable flying around, he or she can help out with this by helping monitor gauges, running checklists, and annotating radio transmissions, if needed.
- **enVironment**: PAVE's *V* component reminds the pilot to assess hazards and risk associated with all elements of the flight environment. These include airport and runway conditions, airport lighting, terrain, obstacles, and airspace restrictions. But one of the most critical *V* elements is weather. Some pilots are qualified to fly only under Visual Flight Rules (VFR), when the weather is good. With more training and testing, a pilot can earn the privilege of operating

under Instrument Flight Rules (IFR), when the weather is not good enough for visual flight. An important thing to remember, though, is that even IFR-qualified pilots cannot, and should not, attempt to fly in all weather conditions. Much depends on the individual pilot's level of training, skill, proficiency, and comfort with given weather conditions. The type of aircraft is also a factor, simply because some airplanes have more capability than others. But *no* GA airplane can safely penetrate thunderstorms or fly in severe icing conditions.

- **External Pressures**: Passengers eager for a trip and people waiting at the destination are good examples of *E*xternal Pressures that can profoundly and adversely impact a pilot's judgment, in part for the reasons I mentioned at the beginning of this discussion. Passengers who are cognizant of PAVE hazards (e.g., pilot illness or fatigue, unfamiliar aircraft, poor weather) can alleviate people-related external pressures in a couple of ways. One is to invite a conversation about hazards identified for this flight. Another is to suggest, and actively assist with plans in the event of a delay or diversion. Passengers who are prepared for these eventualities make it much easier for the pilot to make — and stick to — a "no" decision when conditions so require.

Personal Minimums – Decision Making In Advance

One of the most useful things a pilot can do in aviation safety risk management is to develop and write down personal minimums. In formal terms, personal minimums are an individual pilot's set of procedures, rules, criteria, and guidelines for deciding whether, and under what conditions, to operate (or continue operating). While accurate, the formal definition does not really convey one of the core concepts: personal minimums as a "safety buffer" between the demands of the situation and the extent of both pilot skills and airplane performance.

I like to think of personal minimums as the human factors equivalent of reserve fuel. When the pilot plans a flight, the regulations require calculating fuel use in a way that leaves a specified amount of fuel in the tanks upon landing. Reserve fuel is intended to provide a safety buffer between fuel *required* for normal flight and fuel *available* to avoid total quiet in the engine compartment.

In the same way, a pilot should establish written personal minimums to provide a solid safety buffer between the skills and aircraft performance required for a specific flight, and the skills and aircraft performance available.

Does your pilot have written personal minimums? If not, one of the most helpful things you can do is to encourage him or her to invest the time in developing them. For one approach to this process, you can point your pilot to the "Getting the Maximum from Personal Minimums" article from the May/June 2006 of *FAA Aviation News* (http://www.faa.gov/news/safety_briefing/2006/media/mayjun2006.pdf). The article provides a step-by-step approach and worksheets the pilot can use for this process.

By encouraging consistent pilot use of hazard and risk assessment tools, the right seat passenger can help save lives.

If the pilot does have written personal minimums, you might ask whether the document is up-to-date. Personal minimums are very dynamic, because proficiency levels change (for better and for worse) in accordance with practice.

Once personal minimums have been established and updated, the right seat passenger can contribute to good risk management by asking the pilot to demonstrate that the proposed flight is consistent with those pre-established decisions. In addition to increasing the passenger's level of comfort and confidence, this approach makes it easier for the pilot to make "disappointing" decisions when circumstances so require.

Using the Veto

A final suggestion for GA aircraft passengers seeking to help with decision making and risk management: Negotiate for "veto power," and then use it when you need to. Veto power means that if any aspect of the flight makes the passenger uncomfortable, he or she can use the veto to request prompt diversion to a safe alternate destination. Once safely on the ground, there will be plenty of time to review conditions, discuss options, and decide — together — on next steps that will keep everyone safe and ready to fly again.

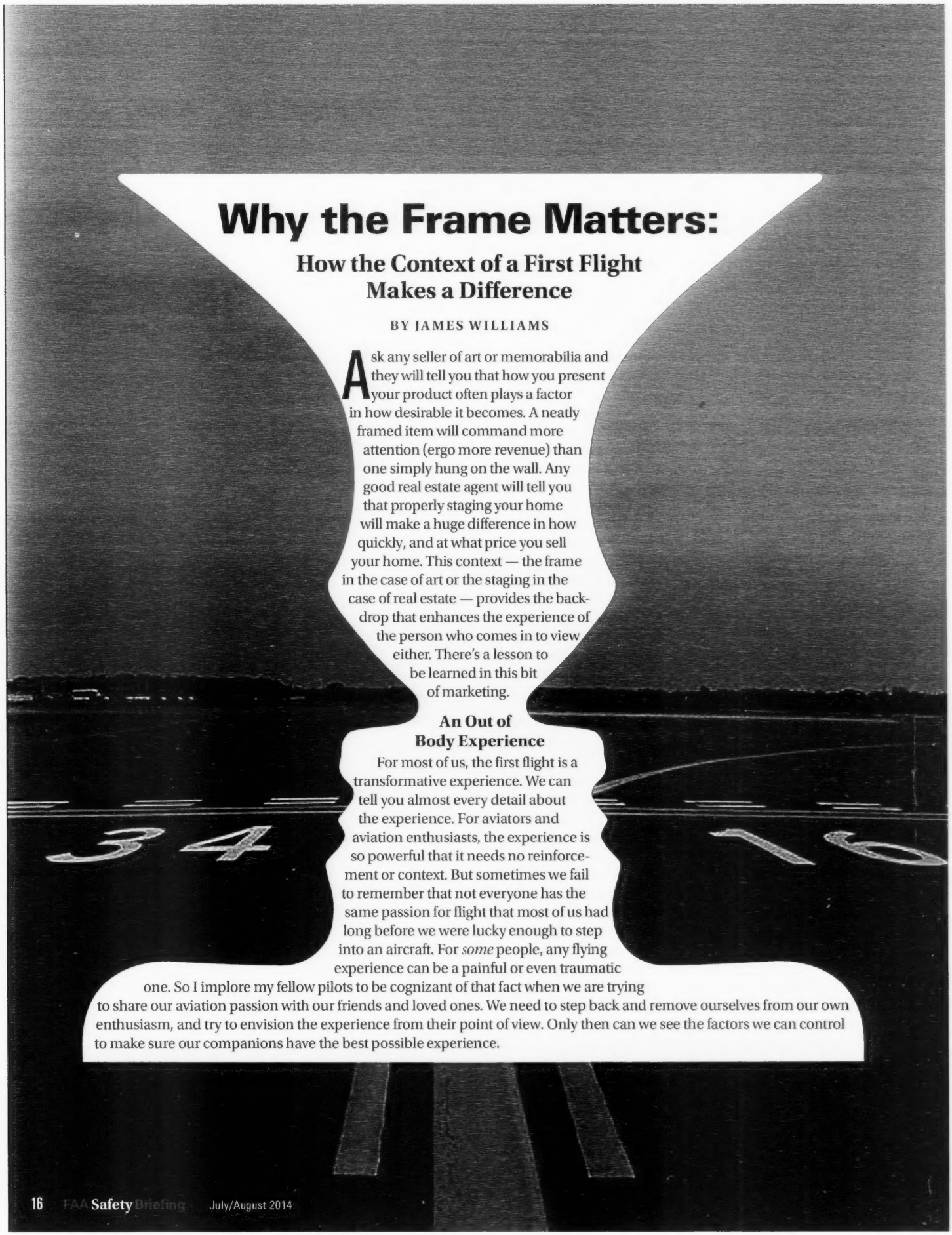
Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. *She is an active general aviation pilot and flight instructor.*

Learn More:

"Getting the Maximum from Personal Minimums" – MayJun 2006 *FAA Aviation News*

"Whither and Whether of Flying in Weather" – JulAug 2010 *FAA Safety Briefing*

"Building Blocks and Safety Circles" – JanFeb 2011 *FAA Safety Briefing*



Why the Frame Matters:

How the Context of a First Flight Makes a Difference

BY JAMES WILLIAMS

Ask any seller of art or memorabilia and they will tell you that how you present your product often plays a factor in how desirable it becomes. A neatly framed item will command more attention (ergo more revenue) than one simply hung on the wall. Any good real estate agent will tell you that properly staging your home will make a huge difference in how quickly, and at what price you sell your home. This context — the frame in the case of art or the staging in the case of real estate — provides the backdrop that enhances the experience of the person who comes in to view either. There's a lesson to be learned in this bit of marketing.

An Out of Body Experience

For most of us, the first flight is a transformative experience. We can tell you almost every detail about the experience. For aviators and aviation enthusiasts, the experience is so powerful that it needs no reinforcement or context. But sometimes we fail to remember that not everyone has the same passion for flight that most of us had long before we were lucky enough to step into an aircraft. For *some* people, any flying experience can be a painful or even traumatic one. So I implore my fellow pilots to be cognizant of that fact when we are trying to share our aviation passion with our friends and loved ones. We need to step back and remove ourselves from our own enthusiasm, and try to envision the experience from their point of view. Only then can we see the factors we can control to make sure our companions have the best possible experience.

Whither the Weather

One of the biggest factors in the first flight experience is the weather. Just as you wouldn't want to take a "first cruise" in the middle of a hurricane, taking a first flight in suboptimal conditions tends to ensure there is no second flight. Unlike a solo flight to do some pattern work, three miles of visibility — while perfectly legal VFR weather — hardly shows off the scenic vistas that great visibility can offer a passenger who is riding along.

Another area of particular concern is turbulence. As experienced aviators, we take a little bit of light bumping as just a "fact of life." To a neophyte, though, those light bumps could feel like a real emergency. So if your favorite area is known for afternoon thermals, it may be a better idea to schedule an earlier flight. And this should go without saying, but *any* flirting with convective weather is a big no-no whether you are with passengers or alone!

Information is a Comfort

As a GA pilot riding as an airline passenger, I always seem to be seated next to the one "phobic" flyer. Without fail, my seatmate seems to be startled by the normal noises that comprise the pushback, taxi, and take-off of our flight. It's easy for those of us with aviation knowledge to rationalize things that might sound downright odd to the inexperienced flyer. We might think, "well that's a hydraulic pump or a flap motor; they must be doing the pre-takeoff checklist." Our knowledge of the mechanical and procedural protocols gives us comfort our fellow passengers lack. The key here is, when flying someone yourself, *share* that info. Let your passenger know what sounds are normal. You should also consider providing a kind of running commentary of what you're doing and why. "I'm going to run up the engine here to test it before we take-off." The bottom line is your new passengers should know what's coming well before it happens. This is where a really good passenger briefing comes in (see this edition's Checklist for more information).

Before you even depart the airport building, let passengers know your qualifications. Explain how you got into aviation, and what qualifies you to be their aerial guide. Make sure your passenger and any other interested parties (i.e., parents) know that you're a competent and qualified aviator.

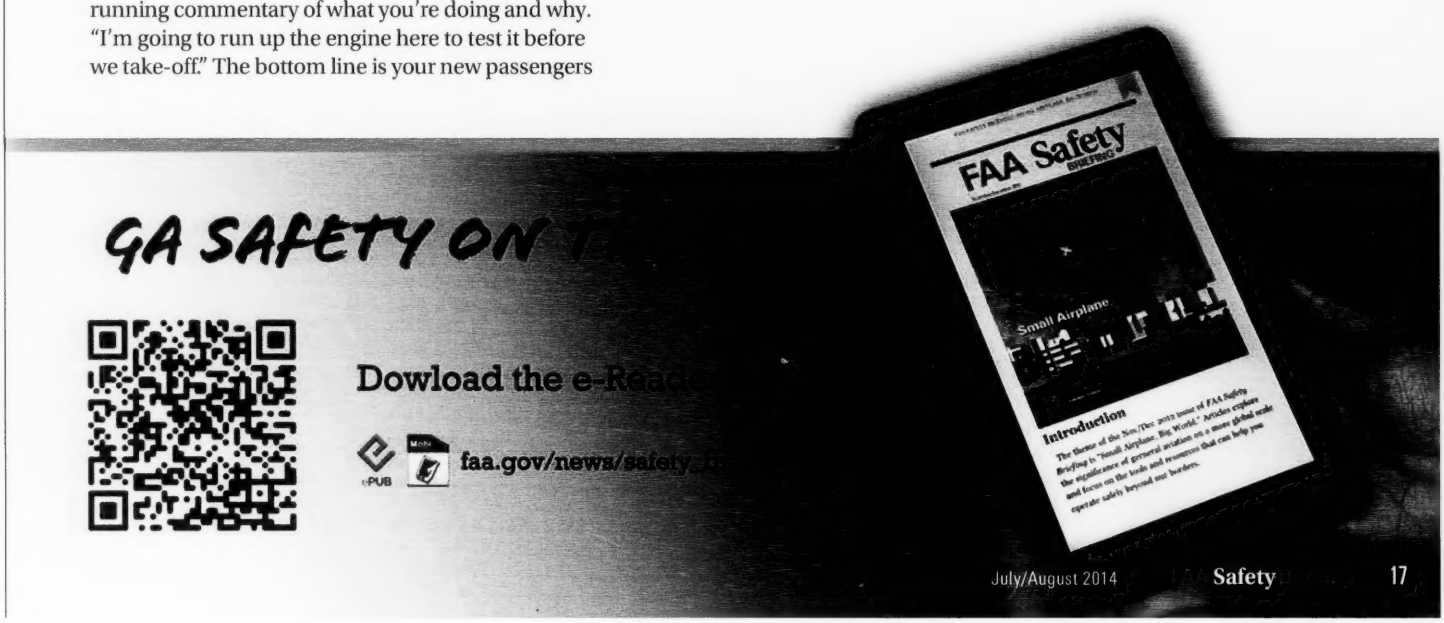
"Your energy and enthusiasm can turn an interesting experience into a lifelong passion, it's just that simple."

Steer clear of things like unusual attitudes, stall practice, or any aggressive maneuvering. While stall practice can be a very useful demonstration (i.e. "hey if the aircraft stalls, this is all we have to do to recover") the first flight is absolutely the wrong place for this lesson.

One final piece of advice comes from long time flight instructor and flight school manager Marcel Bernard. He says to "be enthusiastic; never treat an introductory flight like a chore." Bernard explains "Your energy and enthusiasm can turn an interesting experience into a lifelong passion. It's just that simple."

The "first flight" should focus on providing the smoothest, most enjoyable experience possible. We can do that by providing the best possible stage and the best possible frame.

James Williams is FAA Safety Briefing's *assistant editor and photo editor. He is also a pilot and ground instructor.*



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The service is free and can be found at:

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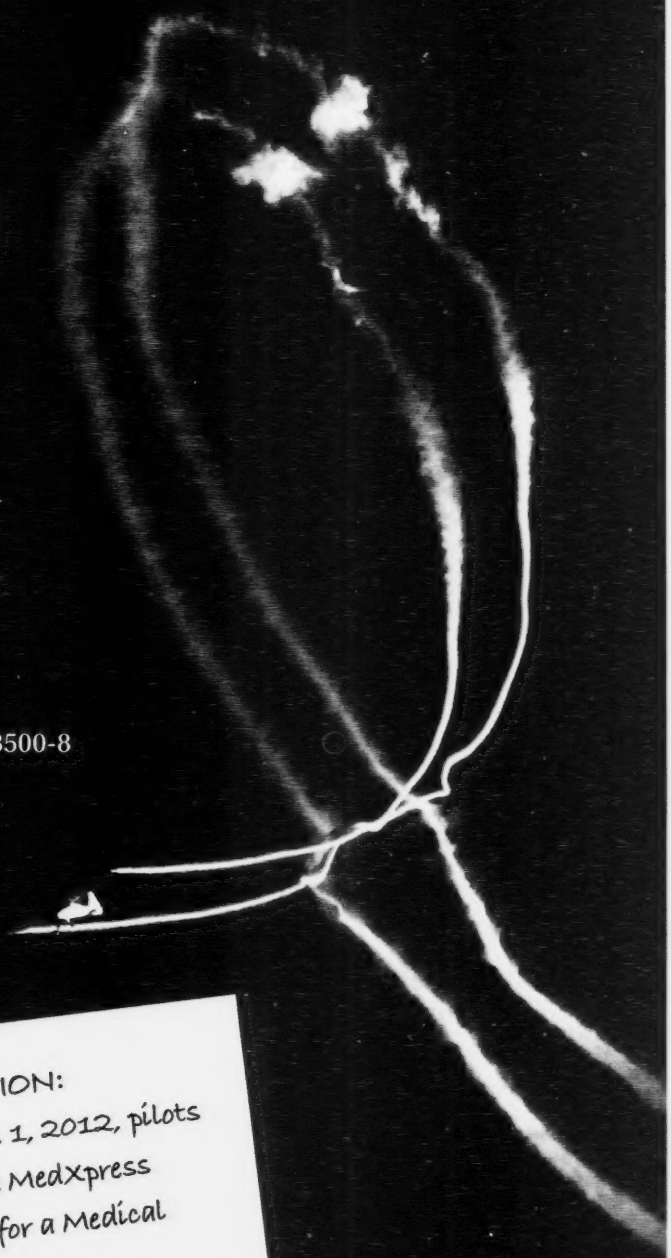


ATTENTION:
As of Oct. 1, 2012, pilots must use MedXpress to apply for a Medical certificate.

"Don't *MAKE* Me Turn This Thing Around!"

or, A Guide on How To Treat Your Pilot

BY SABRINA WOODS

Summer is here, and for a lot of people that means it is time to pack up the family-hauler and take off for sights unknown and grand adventures. Parents, kids, pets, and stuff —packed up, buckled in, and strapped down. Everyone exuberant and ready to go.

That is — until the weather changes, and the previously plotted course has to change as well. Then your spouse expresses displeasure that you won't make the Big Event in time. Junior declares he's hungry. Youngest child touches middle child's things, causing the latter child to shriek. That suitcase you were pretty sure was strapped down comes loose and starts sliding around. And then Rover begins to show adamant signs that he has to relieve himself.

"Don't make me turn this thing around!," my father would bellow after my sister and I pushed him particularly close to the breaking point on a few of those long cross-country trips of my childhood. I am sure some of you can relate — either as beleaguered parents, or as fellow past misbehavers. And while my dad was perfectly capable of making good on the threat (and did at least twice), the act isn't so easy when you are cruising along at 8,000 feet in your Cessna *Skywagon*. Worse, distracting the pilot has proven to be a very risky endeavor, and is routinely found on the FAA's top ten human factors errors list.

So, fellow passengers, this article is for you. Consider this your guide on how to treat your pilot and help ensure your trip is a safe and happy one.

Gettin' Ready

In preparation for your flight, the pilot is going to be very busy engaging in various preflight activities such as checking the weather, filing a flight plan, calculating how much fuel you are going to need, and determining the weight that you are bringing on board. This last part includes fuel, people and pets, and all your luggage. The emphasis on weight can seem a bit much, but in fact it is a very important part of ensuring the airworthiness of the aircraft. (check out Susan Parson's

article, "You Can't Take All That!" in this edition of *FAA Safety Briefing*.) Once all of the preflight planning is done, the pilot should take a walk around the aircraft and accomplish one last check of the fluids.

While the pilot is doing all of that, you can use this time to ensure what you intend to bring on board is truly necessary for your travels. Sometimes there is an urge to pack everything-but-the-kitchen-sink when traveling but, as noted, an aircraft can only handle so much weight. So a bit of prudence must be exercised. Clothing, favorite toys, a few snacks and water, destination-specific items (i.e., a fishing reel), and Rover's food bowl are all great examples of what to bring. A full set of snow gear for your trip to the Grand Canyon in July — you know, in case it gets cold — is probably not such a great idea. Smaller, soft-sided (squishable) bags work best for packing, and liquid medicines and toiletry items should go into sealable waterproof bags in case the contents spill during flight.

Once you have determined what to bring, a good idea is to isolate the (few) items that you will want readily accessible during the flight. These include snacks, border crossing documents, and the handheld gaming system that will keep Junior occupied for hours. Everything else must be properly strapped down so as not to move and become a hazard in flight. This includes Rover. No matter how humorous it may seem to have a pet riding "shotgun," the truth of the matter is that it can become an unpredictable distraction. Therefore, it is best to leave larger pets tethered towards the rear of the cabin, and smaller pets in strapped down travel crates for the duration of the flight.

Adults and older children should have a general understanding of how to operate their own restraining devices. In fact, it is a requirement for the pilot to ensure that passengers get this information. That way you can buckle up and extract yourself quickly should the situation warrant it, and help to take some more pressure off the pilot so he or she can focus on other things.

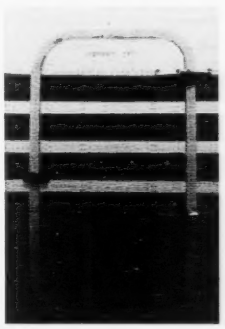
You have the right to feel safe. If at *any* time you do not feel safe or are having any misgivings about the flight, let the pilot know!

Clothing should be appropriate for the climate in which you are flying, so think lightweight, breathable clothes for temperate weather, and warmer, thermal wear for mountain flying. It is *always* a good idea to wear closed-toe, rubber soled shoes when flying because you just never know when you might need to get away from the aircraft as fast as possible. The last thing you want is a flip-flop coming off at a bad time.

My dad's #1 rule when we traveled was that we weren't going to stop unless we absolutely had to. *Period*. That included bathroom breaks. What does that have to do with flying? A great deal, because for the most part, private aircraft don't have "facilities." And while realistically my dad *could* have pulled over and stopped if the situation was dire enough, it is incredibly difficult or impossible to do when flying to your destination. So consider this as a very polite way of telling you to make sure you "go" before you go and limit liquid intake in the hours preceding the trip. That goes double for Rover. Your pilot (and bladder) will thank you for it.

Exits are Here ... and Here

Take time to review the emergency procedures particular to your aircraft before you go. Although it is far easier to discern where aircraft exits are on a Cessna than on a Boeing 777, you need to make sure you know how to operate the doors and which way to egress depending on the situation. It is an excellent idea to make a "get out of Dodge" plan involving all family members should the worst occur and you get into an accident. Some things to identify are: who grabs the emergency kit, who tries to fire-fight, who takes baby/Rover/non-ambulatory person, etc. Running through drills prior to your first flight can help cement procedures in your mind so that it is automatic should the need arise.



It is also beneficial if all adults and age-appropriate children have a general working knowledge of how to work the radio, the GPS, and the emergency locator transmitter as a backup in case the pilot is occupied or unable to do so.

Cone of Silence

Once you are all strapped in and ready to go, the pilot will do a series of final checks in the cockpit before heading out to the runway. At this time, it is very important to invoke the "cone of silence," to use a phrase from the popular 1960s television show, *Get Smart*. But instead of Agent 86 and the Chief, the important information that is being passed back and forth is between air traffic control and the pilot. While they discuss information critical to the flight the passengers need to be quiet to ensure that nothing is missed during the transmission. This means you will need to silence any electronic devises or noise-making toys, too.

There may be several other times during the flight where silence is required, such as when the pilot receives updated data pertinent to the flight path, when there is other air traffic in the area, and when entering the landing sequence. This isn't an excuse to totally check out, however! Passengers can be a great asset to the pilot in helping to look out for nearby obstacles or aircraft. As the old adage goes: two sets of eyes are better than one. If you aren't already familiar

with "o'clock" directional positioning you might want to ask your pilot to teach you. You never know when you will have to tell your pilot to "check six!"

Excitement Management 101

Once airborne, the real adventure begins. Here is where you can probably do the most to endear yourself to the pilot and establish your position in the "greatest passenger ever" hall of fame.

You may not realize it because "s/he goes flying all the time," but your pilot is under a lot of pressure and I don't just mean the actual act of manipulating the aircraft. The FAA, the National Transportation and Safety Board, the Aircraft Owners and Pilots Association, and many other aviation-related industries have all recognized, and advocated for sound aeronautical decision-making (ADM). ADM is the systematic approach to the mental process used by pilots to consistently determine the best course of action in response to a given set of circumstances. One of the biggest factors that can affect good ADM is something called "external pressure."

By nature, the pilot just wants to please and in particular when the passengers are loved ones. He or she can feel the pressure to get to the destination early, to ensure the flight is as smooth and "fun" as possible, or to continue a course of action despite mounting information indicating that it might not be the best choice. If you aren't careful, you can become a walking, talking physical embodiment of external pressure — a passenger who unknowingly and unwittingly places undue stress on the pilot.

To combat this, everyone on board needs to exercise a little "excitement management" and establish realistic expectations. Just like when driving, things might go wrong. The plane could malfunction, the weather might turn sour, or the destination airport might suddenly be inaccessible. So instead of expressing disappointment over changes to your plans, encourage the pilot to adhere to personal minimums and become an active voice of reason. It will go a long way in keeping everyone safe.

Photo courtesy of Mark Giron

"Rights" of Passage

I've mentioned a lot of different things the passenger can do to treat the pilot right, however there are a lot of things that you should expect from your pilot as well. I call this the "rights" of passage and it includes the following:

- You have a right to know what to expect on the flight. This means the pilot should talk to you about potential weather, turbulence, or winds. You should know approximately how long the flight will take, and what it will be like when you get to your destination. Key logistics such as name, phone number, and transport pertaining to the airport and lodgings, should be shared information.
- You should expect to be kept as comfortable as possible, within reason. Environmental controls and seat adjustments should be made, and sound dampening measures used to maintain comfort. Hearing protection is a must, and in particular for the sensitive ears of smaller children. It also doesn't hurt to learn and be able to manipulate these gadgets yourself.
- You should be able to speak up when the phase of flight no longer requires silence. This means that if you aren't feeling well, have a question about the flight or aircraft, or are unclear about anything, you should say something. In addition, there is a lot of potentially scary stuff that goes on during flights: flashing lights, aural alarms, weird engine and aircraft noises, and the like. This brings me to the final and most important "right" in the passenger bill of rights which is;
- You have the right to feel safe. If at *any* time you do not feel safe or are having any misgivings about the flight, let the pilot know! You should ask which beeps are cause for concern and which are "operation normal." You can be a powerful safety-conscious advocate for the pilot, and you have every right to do so. In return, the pilot should do everything in his or her power to put you at ease.

Summertime travels can be the stuff that great memories are made from. With a little respect and understanding between the pilot and the passengers, every trip can be fun, exciting, and safe. Bon voyage!

Sabrina Woods is an assistant editor for FAA Safety Briefing. *She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.*

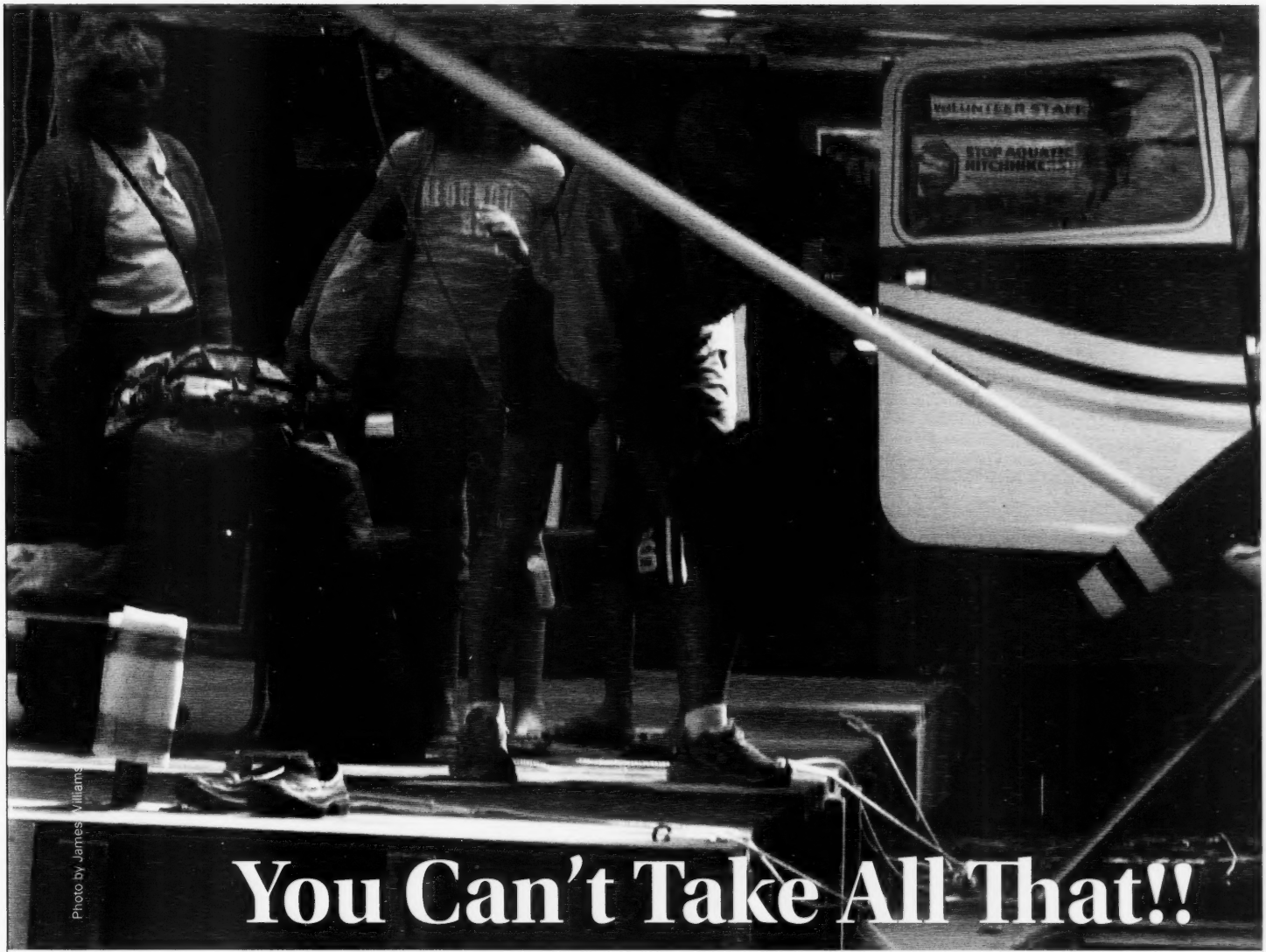


Photo by James Williams

You Can't Take All That!!

What Aircraft Weight & Balance Means to You

BY SUSAN PARSON

One of the joys of traveling in a general aviation (GA) airplane is that you don't have to limit your liquids and gels, or remove your shoes, or go through airport security scanners. Why, you can take anything you like! So you pack accordingly, only to discover that your personal pilot is far more ferocious than the stone-faced screeners at Big Airplane Airport. As soon as you appear with your bags and bundles, your pilot freezes — scowls — and states (or shouts):

YOU CAN'T TAKE ALL THAT IN THIS AIRPLANE!!

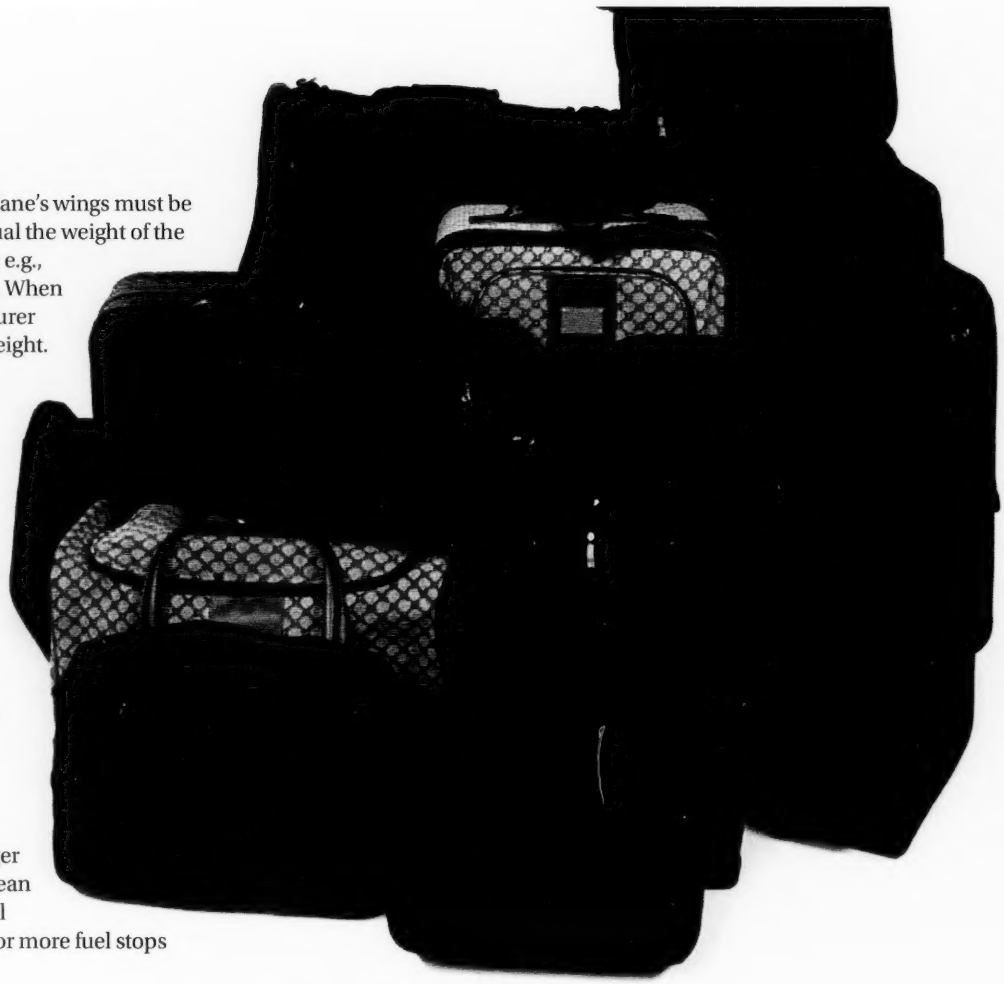
Your offer to take care of fitting it all in, just like you do for family auto trips, doesn't do much to soothe the pilot. On the contrary, he or she gets even more agitated because *YOU DON'T UNDERSTAND HOW IT WORKS*!

For reasons we're about to discuss, most pilots will always prefer to perform (or closely supervise) the loading of baggage and passengers. Still, knowing something about the basics of aircraft weight and balance could reduce some of the tension that can arise on such occasions.

A-Weigh We Go

The description of GA aircraft as "light airplanes" is apt, because "light" is the name of the game. The lighter the airplane is, the faster and higher it can fly with a given type of engine and propeller. Also, keeping the aircraft on the lighter side enables the pilot to carry more fuel, more passengers, and/or more cargo.

Notice that I said "and/or" — not just "and." GA flying involves tradeoffs. The fact that a light GA airplane has four seats doesn't mean that the pilot can always carry four passengers, especially if those passengers have baggage. Nor can the pilot just top off the tanks and launch. Here's why.



In order to stay aloft, the airplane's wings must be able to generate enough lift to equal the weight of the airplane and everything it carries: e.g., people, packages, and petroleum. When an airplane is made, its manufacturer determines its maximum gross weight. You can think of this number as the manufacturer's guarantee that the airplane is capable of generating sufficient lift to carry that amount of weight. It's up to the pilot to decide how to use that set "weight allowance" on any given flight. In most cases, it is simply not possible to load a light GA aircraft with full fuel, full seats, and passenger bags without grossly exceeding the manufacturer's established value for maximum gross weight.

So the pilot has to make choices, which means that passengers may be "volun-told" to pack very lightly. Or, if all passenger seats will be occupied, it could mean launching with less than a full fuel load — which might require one or more fuel stops en route to the destination.

Hanging in the Balance

You have dutifully (albeit reluctantly) agreed that you can't take all THAT, and limited your luggage accordingly. So now you wonder why the pilot starts rearranging the items you've already stowed in the baggage compartment, and why he or she is making passenger seat assignments.

That's where the "balance" part of "weight and balance" comes in. To be stable in all phases of flight, an airplane's weight must be balanced around a point within a fairly narrow range of values established when the airplane is manufactured and flight-tested. The idea is to avoid loading the airplane in a way that makes it either nose-heavy or tail-heavy.

To achieve this goal, the pilot uses the manufacturer's paper charts and graphs or, more likely nowadays, apps containing that data, to make a weight and balance calculation. The weight part of the equation is fairly obvious: the pilot starts with the airplane's published empty weight, and totals the weights for passengers, bags, and fuel to calculate the total weight.

As long as the total weight is below the airplane's published maximum gross weight, the pilot can proceed to the next step of calculating the airplane's "center of gravity," or CG. This process involves multiplying each component of the weight (e.g., pilot and front seat passenger) by the published "station" value for that specific load-carrying position. The product of this calculation is called the "moment." Once the pilot has calculated all the moments, the next step is to add them together, and then divide total moments by total weight. The resulting number is the CG — the airplane's balance point. The final step is for the pilot to check the charts and ensure that the CG is within the acceptable range. If so, good to go. If not, the pilot will need to rearrange the load by moving passengers or bags until the CG is acceptable.

Once weight and balance is calculated and within acceptable limits, away you go!

Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. *She is an active general aviation pilot and flight instructor.*

Passenger SAFETY Briefing

S
Seat belts fastened for taxi, takeoff, landing.
Shoulder harnesses fastened for takeoff, landing.
Seat position adjusted and locked in place.

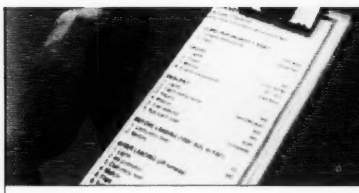
A
Air vents (*location and operation*).
All environmental controls (*discussed*).
Action in case of any passenger discomfort.

F
Fire extinguisher (*location and operation*).

E
Exit doors (*how to secure; how to open*).
Emergency evacuation plan.
Emergency/survival kit (*location and contents*).

T
Traffic (*scanning, spotting, notifying pilot*).
Talking (*"sterile cockpit" expectations*).

Y
Your questions? (*Speak up!*).



Checklist

SUSAN PARSON

S-A-F-E-T-Y Briefing

You are undoubtedly familiar with the passenger safety briefing that flight attendants provide on commercial airliners. Did you know that the FAA also requires private pilots to ensure that their passengers get a pre-takeoff safety briefing? If you are a right-seat passenger looking for ways to get more involved in GA flight activities, here's a checklist you can run on the pilot's behalf.

Seatbelts

The regulations give the pilot in command (PIC) two specific tasks with regard to seat belts and shoulder harnesses. First, the PIC must ensure that each person on board is briefed on how to fasten and unfasten that person's seat belt and, if installed, shoulder harness.

Second is a duty to notify passengers that seat belts must be fastened before the pilot can legally take off, land, or "cause (an aircraft) to be moved on the surface."

It is also a good idea to brief your passengers on how to adjust and lock each seat into position.

Air

The second major item is environmental controls. Show all passengers where the air vents are located, and tell them how to open and close overhead and/or floor-level vents in their seating area. Many GA airplanes have other environmental controls (e.g., cabin heat) located somewhere on the instrument panel. If passengers are airplane-savvy, show them how to adjust some or all of these controls. Unless passenger have some experience in GA aircraft, though, it may be best to tell them to let you know if they need you to make adjustments.

The subject of air brings up a more delicate issue — airsickness. Opinions differ widely on whether, and how, to discuss this topic. Some advocate a direct approach, including a full briefing on location and use of airsickness bags. Others believe that a specific briefing triggers the power of suggestion in potentially queasy passengers, and prefer to avoid the subject entirely. You be the judge, but at a minimum you want passengers to tell you right away if they feel uncomfortable.

Fire Extinguisher

If you have a fire extinguisher on board — you do, right? — show all passengers where it is located, how to unlatch it from its mount, and how to use it in the unlikely event of a fire.

Equipment

Make sure all passengers know how to open the door(s) in the event of an emergency evacuation, but it is also important for them to know how to properly secure the door(s). Be sure to explain any equipment, such as supplemental oxygen, that passengers are expected to use during the flight.

For emergency preparation purposes, develop and brief exit procedures. This step is especially important in airplanes with doors on both sides of the fuselage. For example, your plan might call for keeping the left (pilot) seat forward to allow rear seat passengers to exit via the left door, with front seat occupants exiting via the right. Designate a post-exit gathering point and, if you carry survival equipment, make sure everyone knows where it is stowed.

Traffic and Talking

It never hurts to have extra eyes scanning for traffic, so brief passengers to speak up whenever they spot other aircraft. A simple "airplane on the right" will suffice, but you might teach them to give you traffic information in terms of the "o'clock" positions used by ATC.

Expectations for communications — *talking* — is another good topic to include. Passengers will certainly understand that there are times when the pilot needs to focus fully on flying. Let passengers know that they should not attempt to talk to the pilot (except for traffic point-outs) during the busy takeoff/ climb and approach/landing phases of the flight. Passengers should also minimize their own conversations during these times.

Your Questions?

Give passengers an opportunity to ask questions about any part of the flight. Since some passengers may be intimidated by the novelty of GA flying or embarrassed to ask "dumb" questions, watch for any signs of confusion or concern. Make a special effort to invite those questions needed to clarify any part of the briefing they did not understand. The question time is a great opportunity to reassure a reluctant rider, or to encourage a potential future pilot's interest in aviation.

Checklist complete!

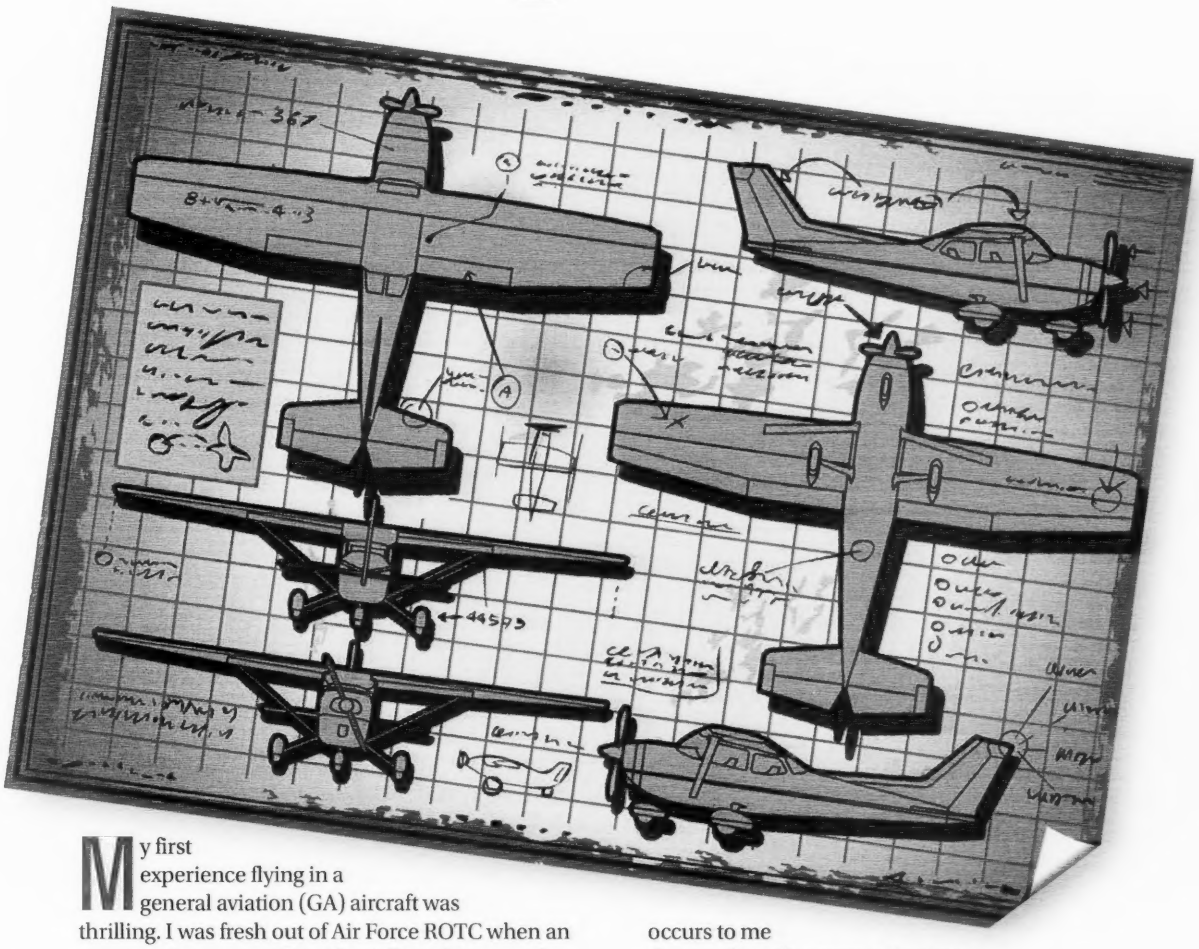
Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. *She is an active general aviation pilot and flight instructor.*

Learn More

For a more detailed version of this approach to the passenger safety briefing, see page 8 January/February 2007 issue of *FAA Aviation News* which can be found here: http://www.faa.gov/news/safety_briefing/2007/media/JanFeb2007.pdf

WikiAnswers:

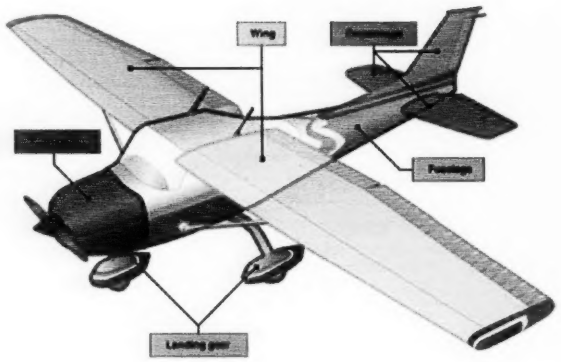
How Airplanes Work



My first experience flying in a general aviation (GA) aircraft was thrilling. I was fresh out of Air Force ROTC when an opportunity arose to fly with a fellow alumnus who had earned a private pilot certificate before entering active duty and had already accumulated over 300 hours in his father's Piper *Archer LX*. The pilot, another brand new second lieutenant, and I hit the skies in an exhilarating 48-minute adventure over Flagstaff, Ariz., just skirting the edges of the great Grand Canyon. It … was … *awesome*. To my fellow passenger? Not so much.

On edge the entire time, he just didn't appreciate the soaring heights and majestic views like the pilot and I did. Every beep and squeak that emanated from the aircraft left him white-knuckling the seat, and the constant thrum and vibration from the Lycoming engine made him ill. At the time, admittedly, I was less than sympathetic to his plight. I was too much into my own moment. But now, looking back on that day, it occurs to me that my friend's nerves going into the trip probably played a huge role in his in-flight misery. And, as a result of that day, it is very likely his attitude towards GA soured forever. It occurs to me, *now*, that perhaps if he had just known a bit more about how an aircraft works and how much training our buddy went through to even be certified to fly us, he might have relaxed a bit and enjoyed more of what that experience had to offer.

Mathematician Daniel Bernoulli published in his book, *Hydrodynamica*, that as the speed of a moving fluid (liquid or gas) increases, the pressure within the fluid decreases. Aircraft engineer Henri Coandă discovered the wall-attachment phenomenon, which is the tendency of a moving fluid, either liquid or gas, to attach itself to a surface and flow along with it. And lastly, in *Principia Mathematica Philosophiæ*



Naturalis, Sir Isaac Newton's penned his third law of motion that states for every action there is an equal and opposite reaction. These three principles, as well as aerodynamics — the study of gases in motion — are how airplanes work.

For those of you that feel as though you have been launched into a bad episode of *Big Bang Theory* and require just a bit more information to understand the rather complex and beautiful nature of how aircraft fly: relax. I am going to break this all down quite a bit further so hang in there and read on.

Vitruvian Plane

Most powered GA airplanes can be divided structurally into five major categories: the powerplant (engine, propeller), the fuselage (cockpit and cabin), the empennage (tail), the landing gear, and the wings.

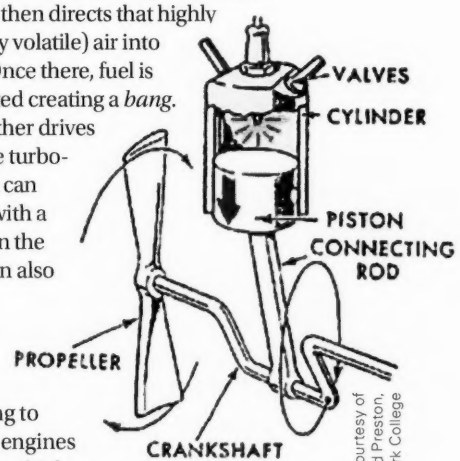
Two major subcategories are the flight control surfaces (i.e., elevators, flaps, rudder) for the wings and empennage; and the avionics/navigation package (i.e., airspeed, altimeter, GPS units, etc.) for the fuselage. All these things work in concert and are controlled by a pilot who manipulates each in order to achieve his or her goal of flight. There are a whole host of other components and subcomponents in an aircraft that I could discuss (with *zeal*), but for this article we will just stick with these basics. If you should want to learn more, http://go.usa.gov/k6aW from the National Aeronautics and Space Administration (NASA) is a great place to start.

Heart of the Matter

The function of the landing gear and fuselage is pretty self-explanatory so we will focus on the other components starting with the powerplant, or, the heart of the aircraft. There are two major types of engines: piston engines — driven by a mechanical component within the engine that is connected to other major components to provide rotational torque (twisting force); and gas turbine — which I affectionately like to call the "suck, squeeze, bang, and blow" engines.

The majority of airplanes in the existing GA fleet have piston engines, also known as reciprocating engines. That's because the engine gets its power via one or more reciprocating pistons that convert the pressure they generate when they draw, compress, fuel, and ignite air in a series of small chambers, into a rotational motion. That motion is transferred to a crankshaft, which in turn powers the propeller, which creates thrust (pull). There are many different types of piston engines to include rotary, in-line, v-type and radial, to name a few. These categories allude to how the pistons are organized within the engine to affect power production.

A gas, or "jet" turbine, is a four-staged system that starts with a powerful fan at the front of the motor. As air is *sucked* into the fan it is directed into the compressor section. This section *squeezes* the air through a series of smaller spinning fans and then directs that highly compressed (and thus very volatile) air into the combustion section. Once there, fuel is added to the mix and ignited creating a *bang*. Then that heated up air either drives a rotating shaft, as with the turboprop and turboshafts, or it can be *blown* out the back as with a turbojets and turbofans. In the case of turboprops, this can also drive a propeller.



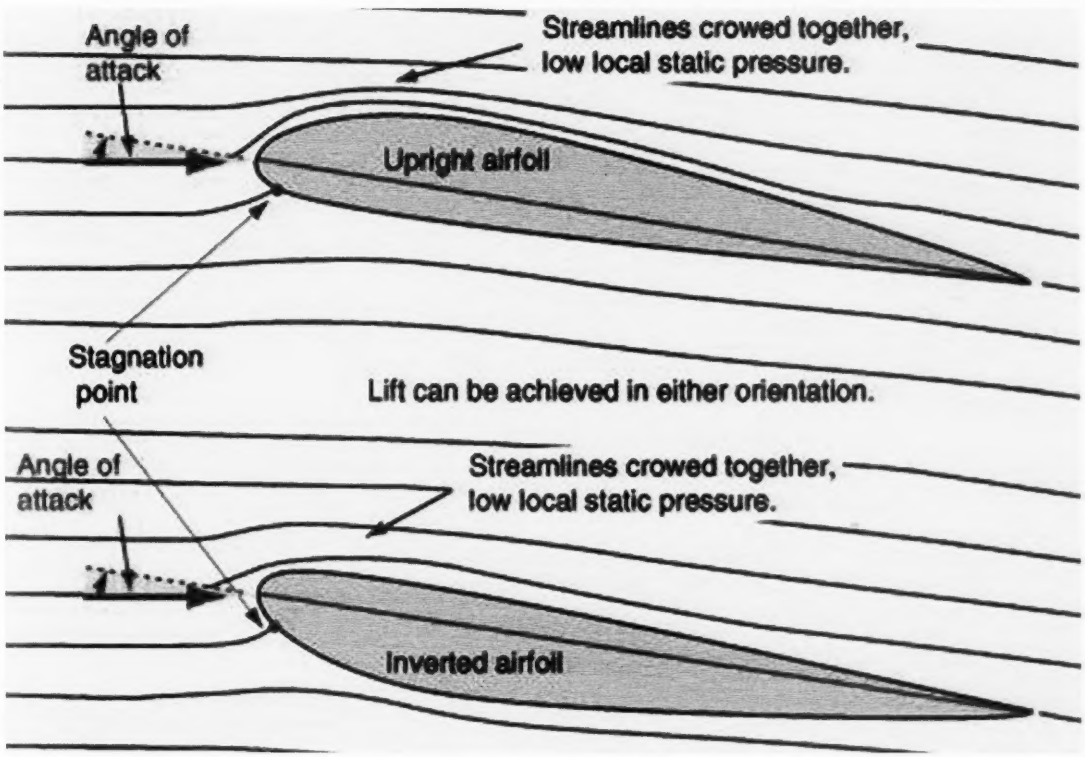
Courtesy of Raymond Preston, Selkirk College

Aircraft engines can be broken down into many more sub-categories but the biggest thing to remember here is that all engines enable *thrust*, the force by which an aircraft moves forward through the air.

The Wind Beneath My Airfoil

Easily the most recognizable structure that identifies a machine as an airplane is its wings. The special shape of an airplane wing makes it an "airfoil." Here's a simplified description of how it works. As an airplane moves forward and air is split around the wing, the angle and curve of the top half of the wing allows for the air to move over it much faster and with much lower pressure than the air below it. Since the higher pressure air below the surface always wants to escape to lower pressure spaces, the wing is "lifted" up. The faster the plane travels forward while maintaining a sufficient angle of attack (tilt), the greater lift is generated.

In case you were wondering, this still works when the airfoil and the aircraft it is attached to are upside down. An adjustment for what is called the "angle of attack" keeps the air moving over the inverted wing, ensuring that there is still enough lift to keep the plane flying. If at any time the "critical" angle of attack is


Angle of attack
Streamlines crowed together, low local static pressure.
Upright airfoil
Stagnation point
Lift can be achieved in either orientation.
Angle of attack
Streamlines crowed together, low local static pressure.
Inverted airfoil
Courtesy of NASA

exceeded — meaning the angle at which the airfoil produces the maximum amount of lift — the aircraft may stall. This means that the airfoil will experience a reduction in lift. The engines can still be turning and the aircraft can still be moving forward, but being that lift is no longer produced, the other forces that act upon the aircraft (i.e., drag/weight) will eventually take over. All the pilot has to do to recover from the stall is to lower the angle of attack so the wing can once again generate lift. Stall recovery is one of the first things fledgling pilots practice in flight training.

Example of an aircraft empennage.

In order to control the air that flows around a wing and maneuver the body of the aircraft in flight, an aircraft comes equipped with flight control surfaces. For the wings, these control surfaces take the form of flaps and/or ailerons.

Most flaps are attached to the trailing edge of the wing. They can increase or decrease the amount of lift by effectively increasing or decreasing the curvature of the wing. Extending the flaps can increase the lift a wing can generate, but it also creates drag (air resistance). This slows the aircraft (i.e., for landing) and lowers the speed at which an aircraft will stall. The weight of the aircraft and its occupants are what eventually get it to the ground for good. Once safely down, the pilot will raise the flaps to ensure there is no extra lift being generated and the aircraft can brake properly. In some cases, flaps can also be used to change the pitch (nose up/nose down) of an aircraft.

Ailerons are a hinged control surface found on the trailing edge of a wing typically located next to the flaps. They work opposite from one another to control bank (roll). As one aileron lifts up the other drops down, causing the aircraft to roll. When combined with a pitch up motion, the aircraft will also turn.

Bringing Up the Rear

The last structural section is the empennage, or tail end of the aircraft. In most GA aircraft, a rudder is housed in the vertical part of the tail called the vertical stabilizer. The rudder is a hinged vertical flap that is operated by foot pedals in the cockpit. In some aircraft the rudder can assist with making turns on the ground during taxi via a steerable nose or tailwheel that is typically linked to the rudder pedals. The rudder is used to keep the fuselage aligned with the direction of flight by controlling yaw (nose left or right).

In addition to the signature "vertical" of the empennage, you will usually find two more little wing-

like structures that help to stabilize and control the aircraft in flight. This structure is called the horizontal stabilizer. Attached to the trailing edge (on most aircraft) are elevators, which move up and down to make the aircraft climb and descend in flight.

Back to the Science

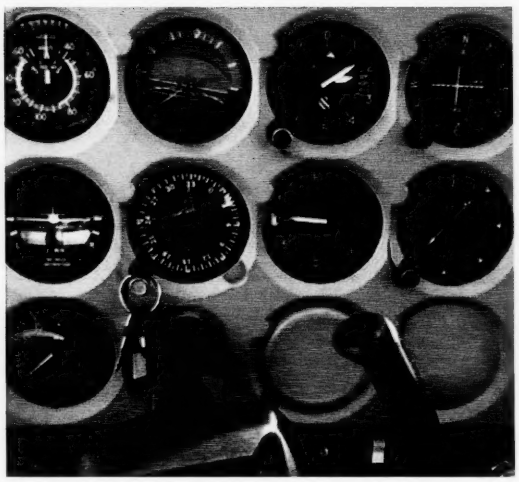
By now you should have a pretty good idea about the four forces keep an aircraft flying: thrust, lift, drag, and weight. Another way of saying this is the forces that push an aircraft forward, upward, downward and backward, and downward, respectively. Plenty (and I mean *plenty)* of people like to argue the Bernoulli, Coandă, and Newton theories that, on a quick read, seem to contradict one another. In truth, they actually complement each other quite well, and NASA agrees (http://go.usa.gov/k6xP).

The short version is that Bernoulli's principle best describes the effects of velocity versus pressure within a fluid, or in this case, the air. The resulting effect is lift, but once that lift is generated, Newton's third law of motion kicks in. The lift (airflow) is an action, so as the action is created it results in an equal and opposite reaction that in turn produces even more aerodynamic forces. Where Coandă fits into all of this is that he first identified that airflow will "attach" itself to nearby surfaces — good news for airfoils everywhere. The part I find humorous is that besides Coandă, these guys never set out to define anything to do with aerodynamics or flying in the first place. I guess it just shows you that you never know what your potential legacy is going to be ... which brings me back to my ROTC pilot buddy. He is the final cog in what makes airplanes work.

My friend had the opportunity to learn and obtain the hours he needed to achieve a private pilot certificate well before he graduated college. This is not an accomplishment to be taken lightly. To get certificated as a pilot, he had to meet age requirements, pass a medical screening, log at least 40 hours of flight training, and pass a practical test — and that is just the start.

Once in the cockpit he had to understand and manipulate an assortment of gauges, switches, levers, and pedals that provided information about the aircraft and gave him control over it. Some more recognizable cockpit devices are the yoke (steering device), the throttle (controls engine power), the radio (to chat with air traffic/controllers), as well as the heading, fuel, speed and altitude indicators. This equipment is just as integral to aircraft flight as the wings or the engine.

His prep for the flight likely started long before we even arrived to the hangar. He had to perform a detailed preflight inspection of the aircraft to make sure it was fueled, airworthy, and in a condition for safe flight. He had to take into consideration how our additional weight would affect the weight and balance



Example of an instrument panel.

of the aircraft and therefore, the stages of flight. He had to chart a course that maintained a balance between not being overly challenging while still affording us a spectacular ride. In addition, he had to brief himself on the weather, and review the rules for the airspace we would traverse on the trip.

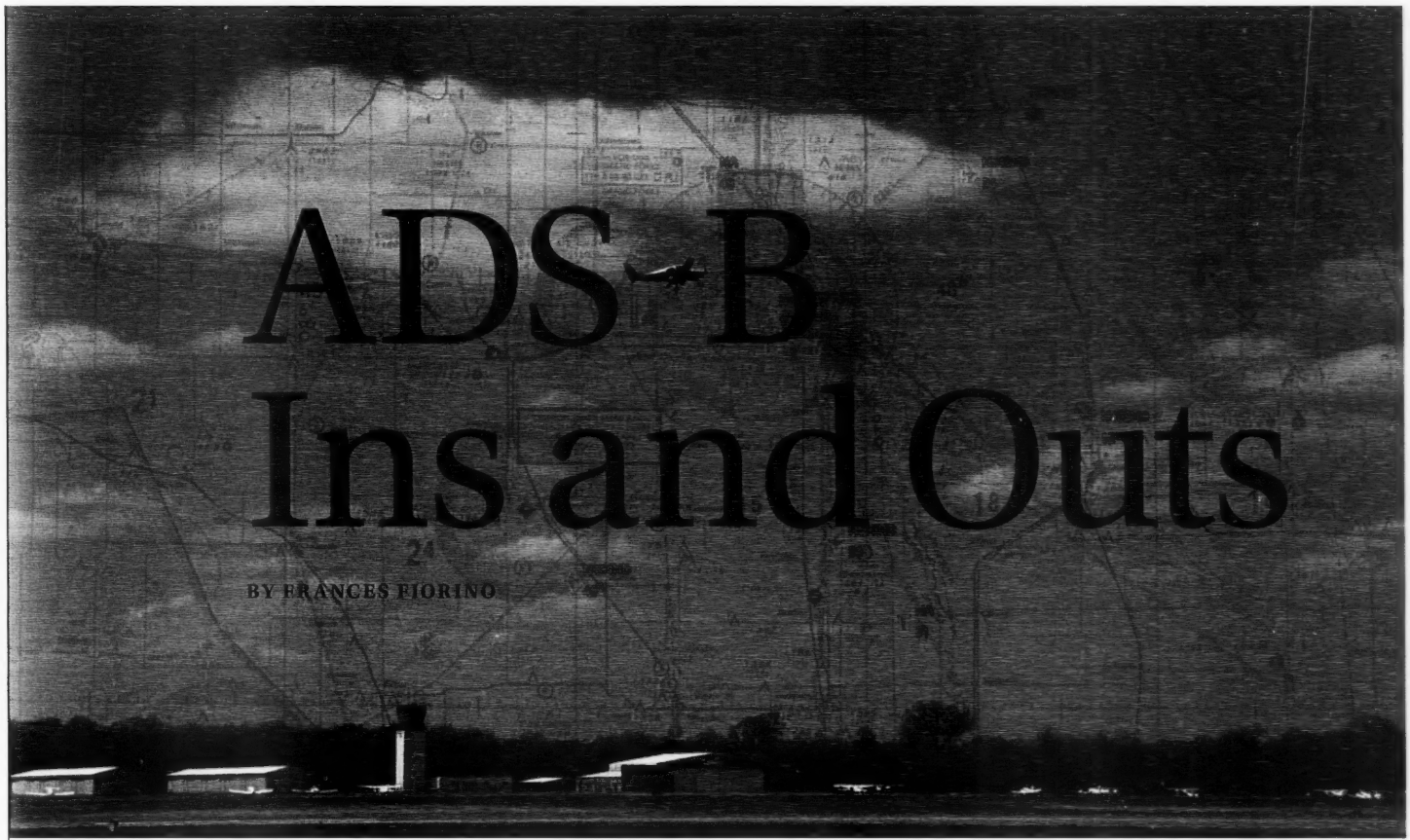
The steps my friend took describe the process that every pilot must follow every time they fly. Where he was perhaps a little deficient was that he failed to make sure that we, as passengers, were also mentally and physically ready for the flight ahead of us. The result was that one out of two passengers didn't know what to expect, and didn't enjoy the experience at all. It remains a valuable lesson to all of us and it is one I want to pass on here.

The chance to ride along with a friend, family member, or coworker as he or she pilots a GA aircraft is a tremendous opportunity. In order to really get the most out of the trip, a little background knowledge goes a long way. So now you know that:

- ✓ The aircraft wants to fly. It has been designed, maintained, and certified to do so.
- ✓ The pilot has been trained and certified to fly it.

So sit back, relax, and hit the skies knowing you know now have a passenger wiki understanding of how an airplane works.

Sabrina Woods is an assistant editor for FAA Safety Briefing. *She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.*



ADS-B Ins and Outs

BY FRANCES FIORINO

You heard about the Automatic Dependent Surveillance–Broadcast mandate: By Jan. 1, 2020, as part of NextGen, aircraft operating in most U.S. controlled airspace must be equipped with ADS-B Out avionics.

How did you react? Pick up the nearest avionics catalog? Banish it from your mind until December 2019? Or ask, "What *is* ADS-B anyway, and what's in it for me?"

Aircraft operating with ADS-B in controlled airspace ensure comprehensive traffic surveillance and, ultimately, an overall safer National Airspace System (NAS). Pilots may be concerned about ADS-B for a variety of reasons, such as cost, fear of a changing flight environment, and lack of knowledge about the technology.

We hear your concerns.

ABCs of ADS-B

ADS-B is more accurate than radar, reporting aircraft movements once every second. ADS-B avionics use GPS and other onboard systems to determine the aircraft's position, speed, and other data and broadcast this information directly to other ADS-B In-equipped aircraft and to the more than 600 ADS-B ground stations installed throughout the country. Ground stations relay the information to air traffic control (ATC) and aircraft equipped to receive the data.

ADS-B's Out function enables data to be transmitted. The In function enables an aircraft to receive data from ground stations and nearby Out-equipped aircraft, as well as traffic advisory, flight information, and weather service products.

- Basic avionics required: a GPS/WAAS (Wide Area Augmentation System) position source and transmitter
- For ADS-B In-equipped aircraft: the addition of a multi-function display and receiver

Being that ADS-B Out avionics transmit data approximately once every second, it enables more precise tracking of aircraft compared with the current radar sweep rates of 3-15 seconds. The smaller footprint of ground radios enables their placement in areas where a radar site would be unfeasible, such as mountainous terrain. The Highly precise GPS-based surveillance provided by ADS-B is also improving our ability to perform life-saving search and rescue operations. Air traffic controllers have better information about an airplane's last position, thus helping to take the "search" out of search and rescue.

With an expanded coverage area and with all aircraft transmitting Out data, controllers will have a highly accurate traffic picture. ATC, in turn, can better manage traffic flow and provide improved surveillance in a period of expanding traffic demand.

Pilots of ADS-B In-equipped aircraft, have the added advantage of seeing traffic and graphic weather on displays, which sharpens situational awareness and crucial see-and-avoid capability.

ADS-B Can Work for You

Early adopters of ADS-B technology are singing its praises. John Croft and his two co-owners of a 1997 Piper *Archer* fly in the traffic-congested Washington, D.C., area reaping the benefits of ADS-B In with a portable unit [Garmin GDL 39]. For instance, Traffic Information Services–Broadcast (TIS-B), transmits traffic information from ground stations to ADS-B In-equipped aircraft, providing pilots with enhanced situational awareness of aircraft operating in the area.

"Midair collisions are my biggest fear in flying," said Croft. "With the TIS-B, I'll see targets on my iPad display and on the portable, and then am better able to make visual contact."

Croft described a scenario he and his partners experience once about every two flights: On a December 2013 flight up the Hudson River Exclusion area, the display showed a target off the left wing and climbing towards the Piper. Remembering the fatal August 2009 midair collision of a tour helicopter and a single-engine aircraft, all three strained to make visual contact, but could not.

"It was tight, but we had enough room to turn away from the target along the river," Croft said. "Just as we turned, we picked up a helicopter visually. It was uncomfortably close. Getting an early alert to a possible conflict helped me avoid it, and certainly brought down my pulse rate."

How to Fly Safely with ADS-B

Trainers of tomorrow's pilots are enthusiastic about the benefits of ADS-B. They shared insights on how to fly safely with the NextGen technology. Certified flight instructors agree that task management skills, scanning techniques, and the ability to correctly interpret traffic data are imperative to safety.

"I feel almost naked if I fly an aircraft without ADS-B," said Chief Instructor Mark Lindquist of Freeway Aviation, a fixed-base operator at Freeway Airport in Bowie, Md.

Students are expected to know pilotage and dead reckoning skills, notes Lindquist. It is up to the instructor as to how early ADS-B technology is introduced in flight training, but it is usually by the time the student has their first solo progress check.

Like most of us, student pilots are taught from day one to keep their "heads-up" and "eyeballs outside" to spot traffic. Any pilot accustomed to analog dials who has switched to glass cockpit knows how mesmerizing the colorful displays can be. When using ADS-B, even on a handheld unit, Lindquist warns against "spending too much heads-down time looking at displays to the exclusion of the pilot's critical responsibility to see and avoid traffic." He also warns against "hyper-situational awareness," where pilots start fixating on targets, not realizing just how far away they are and how little chance of conflict actually exists.

According to Mike Hall, a former military and current general aviation pilot of a 1994 Mooney M20J, and early adopter of ADS-B In and Out, when learning to mine the rich data available from modern cockpit displays "You need to think carefully about task management and what is appropriate to be doing now."

ADS-B, the Multi-purpose Safety Tool

The challenge of instructing the use of ADS-B, and glass cockpit instrumentation in general, is learning how to properly interpret the data on the display, notes University of North Dakota (UND) Chief Pilot Jeremy Roesler.

UND, along with Embry-Riddle Aeronautical University (ERAU), were part of the FAA's original grant to test and operate ADS-B. Each school year, UND trains about 800 to 900 pilots, from private through advanced licenses and ratings, on about 114 aircraft, primarily Cessna 172s. The majority of the fleet is equipped with ADS-B Out. Training is staggered until a student is ready to take on additional instrumentation.

Roesler agrees ADS-B is enhancing safety in the UND flying environment. Grand Forks International Airport airspace is populated with a wide variety of military and commercial aircraft types, helicopters, and unmanned aircraft systems.

ADS-B is also a great tool in planning and managing lessons.

"Instructors can see all the traffic lining up for the instrument approach and can determine whether to request an instrument approach or opt to do something else. We are sold on it [ADS-B] and I don't ever see us going back," said Roesler.

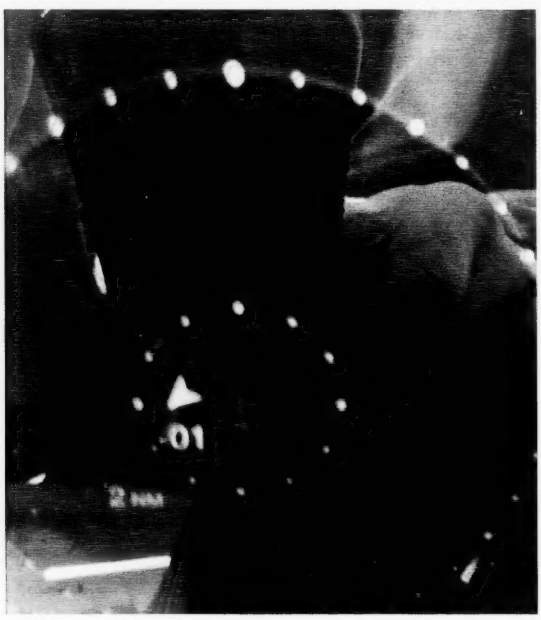


Photo by John Croft

Using commercial software that feeds off an ADS-B display, UND created a unique traffic management tool. A 30-inch screen depicting a sectional chart overlaid with all the traffic in the UND practice area enables the flight desk supervisor to determine how many aircraft to assign to the practice area.

"From a safety perspective, we keep an eye on weather rolling in, winds coming up, or ceilings coming down and can call back students if necessary," said Roesler (see photo).

ADS-B resolved a concern when controllers called UND's flight desk because a UND aircraft had disappeared below radar range and out of radio contact after the pilot told ATC the aircraft was low on fuel. But the UND supervisor was able to locate the aircraft in a traffic pattern at a local airport and confirm that the aircraft and occupants were safe.

"Radar didn't see them, but ADS-B did," notes Roesler.

ERAU uses ADS-B as a traffic awareness tool. The university first became involved with ADS-B in 2001 while exploring ways to mitigate the risk of midair collisions. In an agreement with the FAA, ERAU initiated the first two ADS-B sites and programs in the lower 48. By August 2004, ERAU equipped its fleet at Prescott, Ariz., and Daytona, Fla., campuses with ADS-B traffic displays, according to Prescott's Aviation Safety Program Manager Brian Roggow.

Prescott flies four Diamond DA42NGs, 16 Cessna 172Ss, and one Cessna R182 with ADS-B In and Out capability. Daytona students operate 10 Diamond DA42 L360s, 41 Cessna 172S, and seven Piper PA28R Arrows with ADS-B In and Out.

Both campuses use airspace where high-density training operations are in play, so collision avoidance responsibilities are introduced early in training and revisited throughout the training syllabus. Roggow notes instructors are often challenged with minimizing student's use of cockpit instruments in an effort to develop their ability to fly using visual and kinesthetic cues.

"Visual scanning techniques to include use of the traffic display is a key part of building this skill," adds Roggow. "It is a delicate process to train a student to appropriately manage their attention resources."

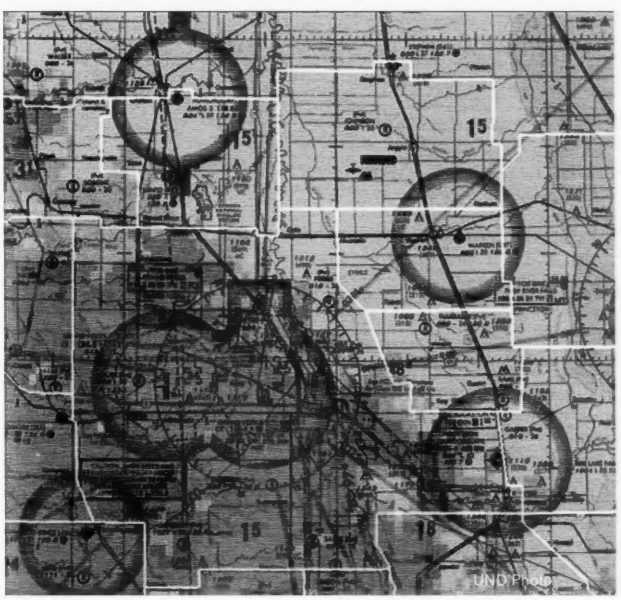
While displays can quickly identify an aircraft well before it becomes a potential conflict, the primary challenge is to prevent the student from overreliance on instruments — or in the case of instrument training, on the instructor — for collision avoidance, says Roggow.

"But students quickly learn to appreciate the value of the ADS-B information, especially after the first time it helps them avoid a close call," said Roggow.

A lesson for all of us.

"Considering the great safety enhancements it provides," Roggow encourages pilots, "Don't delay in getting ADS-B."

Frances Fiorino is Senior Technical Writer in support of FAA's NextGen Performance and Outreach Office. She is a private pilot who learned to fly in New York City skies and has had a 20-year career as an aviation journalist covering safety and training.



Already Equipped?

If your aircraft is one of the approximately 4,200 already equipped with ADS-B Out, congratulations. But you may not be in full compliance, advises James Marks with the FAA's Aircraft Maintenance Division, Avionics Branch.

"Of those aircraft equipped with ADS-B, approximately 3,500 are operating with avionics performance or configuration issues that do not comply fully with the 14 CFR section 91.227 requirements," said Marks. Depending on the type aircraft and on-board equipment that feeds information to the ADS-B system for broadcast, the ADS-B rule can require up to 19 elements to be included with each message transmitted by the avionics.

"We see a high number of avionics systems transmitting information that indicate misconfiguration during initial system setup that are undetectable to the pilot following installation," said Marks.

Some misconfigurations can earn you a call from ATC. This typically occurs when a Mode S transponder and ADS-B Universal Access Transceiver system on the same aircraft are transmitting a 24-bit ICAO address (Mode S) or Mode 3/A code that do not match. ATC systems interpret this information as two aircraft in close proximity and cause traffic conflict alerts.

"Aircraft owners thinking about equipping with ADS-B should read the equipment requirements contained in §91.227 before undergoing an installation and have the install shop demonstrate the correct configuration before the work is accepted," advises Marks.

Those who are already equipped may request verification of their system performance and configuration through the FAA Compliance Monitor. Just send an email with your aircraft's tail number to: 9-AWA-AFS-300-ADSB-AvionicsCheck@faa.gov. The results will either confirm a good installation or provide information on how to correct an improper installation.

ADS-B Out Mandate and Equipment Requirements FAQs

What Pilots Want to Know

What are the rules?

The FAA published Federal Regulation 14 CFR 91.225 and 14 CFR 91.227 in May 2010. Entire text at www.ecfr.gov Final rule: http://edocket.access.gpo.gov/2010/pdf/2010-12645.pdf. The final rule dictates that effective January 1, 2010, aircraft operating in airspace defined in 91.225 are required to have an Automatic Dependent Surveillance - Broadcast (ADS-B) system that includes a certified position source capable of meeting requirements defined in 91.227. These regulations set a minimum performance standard for both ADS-B Transmitter and the position sources integrated with the ADS-B equipment your aircraft.

How many ADS-B avionics systems are there?

There are two ADS-B avionics systems available: 1. Mode S transponder based (1090MHz) ADS-B equipment certified to Technical Standard Order C166b TSO – C166B and 2. Universal Access Transceiver (UAT) equipment certified to Technical Standard Order TSO-C154c. UAT equipment provides ability to receive traffic and weather data provided by the FAA ADS-B network.

What system should I use?

For aircraft operating above FL180 (18,000 feet) or internationally, you must be equipped with a Mode S-Transponder based ADS-B transmitter.
For aircraft operating below 18,000 feet and within U.S. airspace, you must be equipped with either a Mode S transponder or with UAT equipment.

What position source should I use?

FAA recommends a Wide Area Augmentation System (WAAS) GPS that is compliant with TSO-C145 or TSO-C146. These units are readily available for general aviation and provide sufficient performance to meet the 14 CFR 91.227 requirements. GA vendors offer stand-alone receivers and packet them with a ADS-B transmitter or with GPS Navigator.

Can I mix and match ADS-B equipment with any GPS equipment?

No, a GPS receiver must be compatible with the installed ADS-B transmitter (reference list adjacent). Mixing and matching GPS systems with ADS-B units in the field (accomplished via field approval) is not permitted unless the equipment was shown to be compatible via a previous certification effort with the FAA (for example, a Supplemental Type Certificate). Be sure to contact your manufacturer if you are unsure which GPS systems are approved for your ADS-B system.

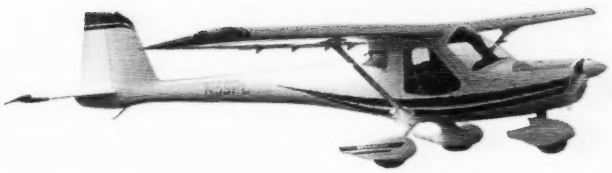
Some manufacturers are marketing uncertified ADS-B transmitters. Can I install these on my aircraft?

You may install an uncertified transmitter on amateur built aircraft and light-sport aircraft with experimental airworthiness certificates. However, you cannot install uncertified equipment, including uncertified transmitters on any aircraft with a standard airworthiness certificate. Also, uncertified ADS-B transmitters do not comply with 14 CFR Part 91.227 and will not be permitted to operate in §91.225 airspace requiring ADS-B after January 1, 2020, without prior approval from air traffic control (ATC).

ATC cannot use the data from uncertified transmitters — this means ATC cannot provide flight-following services or separation services to these aircraft. Data from the uncertified transmitters is not displayed on certified ADS-B-In displays. Therefore, your fellow pilots in aircraft with certified ADS-B equipment won't be able to "see" you. The FAA strongly discourages the use of uncertified ADS-B Out equipment even in experimental aircraft.

Can I install an uncertified GPS as my ADS-B position source?

You may install an uncertified GPS on amateur-built and light-sport aircraft with experimental airworthiness certificates. As stated above, you cannot install uncertified equipment, including an uncertified GPS on aircraft with standard airworthiness certificates. Additionally, these position sources do not comply with 14 CFR 91.227 and will not be permitted to operate in airspace requiring ADS-B in 2020 without prior approval from ATC.



What are the risks of using an uncertified position source?

The risk for any GPS receiver, when used to support separation services, is how far the position measurement can be in error without detection. If the position error gets large enough, air traffic control would not be able to provide safe separation between your aircraft and other traffic in your vicinity. FAA and our international peers conducted a safety analysis prior to publishing the final ADS-B rule to determine what this error detection boundary should be and the ADS-B performance requirements are based on the results of this safety analysis.

Certified GPS sensors compare GPS satellite measurements against each other. When a satellite signal error becomes large enough to detect, the receiver will reject that signal. The integrity performance specified in the ADS-B rule depends on the proper operation of this error detection feature. It ensures the safety of using ADS-B positioning based on GPS measurements.

By comparison, uncertified commercial grade GPS sensors assume the system is working properly and do

not attempt to detect errors in the satellite measurements. When presented with an erroneous measurement, they will calculate an erroneous position. This was proven to be an unsafe condition by the FAA's safety analysis. Therefore, ADS-B position based on these sensors was prohibited from being used to support air traffic separation and ADS-B air-to-air operations.

What can I buy today?

Several manufacturers are selling approved avionics. Several other manufacturers have products in development that will be available in time to meet the 2020, mandate for ADS-B Out. Some of the approved GPS receivers are certified GPS navigators as well. They may be installed to support precision approaches in addition to providing a position source for your ADS-B system. In some cases the GPS receiver may also be integrated with a Multi-Function Display providing a moving map, an ADS-B Traffic Display, access to the Flight Information Services–Broadcast information, and more.

The FAA does not endorse any particular item or manufacturer. The following list, current as of May 1, 2014, contains items that have met FAA certification requirements. Check the FAA ADS-B site for updates to the list.

Manufacturer	ADS-B Model Number	Approved Position Source
ACSS	XS-950	RCI GLU-920 , RCI GLU-925
Honeywell	XS-852	CMC CMA-4024-1 SBAS
Trig-Avionics	TT-31	FreeFlight WAAS 1201 Accord Technology NexNav™ Mini GPS unit
FreeFlight	FDL-978-TX	FreeFlight WAAS 1201
ACSS	XS-950	RCI GLU-920 (A320), Thales TLS8755-01-0101A/0102B (A330)
Honeywell	ISP-80A.1	Honeywell ADIRU Part#'s HG2030BE02, BE03 or BE04
Trig-Avionics	TT-22	FreeFlight WAAS 1201
Garmin	GDL-88 GTX-23 GTX-33x w/ES GTX-330x GTX-3000 (GTX models require appropriate S/W rev)	Garmin GTN 625/635/650, GTN 725/750, GPS 400W, GNC 420W/420AW, GNS 430W/430AW, GPS 500W/530W (w/ or w/o TAWS) (all require appropriate S/W rev)
Honeywell	MRC XPDR w/ADS-B Out	CMC CMA-3024 SBAS GNSSU MK II and CMA-4024 SBAS GNSSU
Honeywell	XS-858B Transponder, P/N 7517402-970	Honeywell GPS module (made by CMC), P/N 245-604067-100
Honeywell	XS-858B P/N:7017401-970	Honeywell GNSS/MMR VIDL-G, P/N: 7026208-804
NavWorx	ADS600-B	Accord Technology NexNav™ Mini GPS unit
FreeFlight	FDL-978-XVR	FreeFlight WAAS 1201 (either external or integrated in FDL-978-XVR)
Rockwell	TDR-94D-550	Universal UNS-1Fw
Avidyne	AXP340	Avidyne GPS (including R9) Garmin GNS430W/530W Garmin GTN650/750 FreeFlight Model 1201/1204 NexNav™ mini-T (external)
BendixKing	KT-74	Accord NexNav™ Mini GPS unit FreeFlight WAAS 1201

SABRINA WOODS

"Beeps and Squeaks"

Being unfamiliar with the sounds an airplane might emit can increase anxiety if you are new to flying in general aviation aircraft. The whir of the gyros, the beeps of approach markers, and all of those little creaks and rattles. A regular cacophony of sound — at least to your ears — and you aren't privy to knowing which ones are cause for concern and which ones are simply "normal operating procedure."

If you are already feeling uneasy going into a first flight, your normal auditory ability might ratchet up to near bat-like levels. To you, the simple thump and whump of the fuselage being subject to air pressure might seem like the aircraft is about to implode. The sudden, deafeningly quiet of the engine as it throttles back for level flight might have you convinced you're going to fall out of the sky. And *confound it* if that darned pilot doesn't have the courtesy to seem at least a little bit concerned about your impending doom!

Simply put, the majority of aircraft operators take far better care of their aircraft than many drivers take care of their vehicles.

All humor aside, the best way to ease whatever fears might arise while flying is to ask questions throughout the experience. A simple, "what is that noise?" goes a long way to understanding. The bonus is that the more you fly and learn, the more accustomed to the idiosyncrasies of the aircraft you will become.

Old Aircraft ≠ Old Car

"But this thing is ancient!" you cry when introduced to your best friend's 1948 Luscombe 8F *Silvaire*, despite its pristine blue and silver paint scheme gleaming out at you. Surely, you think, *surely* it is going to rattle itself into a million pieces. I mean, you wouldn't want to drive a car that old would you?

A lot of people think that way; wondering why aviators are risking their lives in these aircraft when you wouldn't drive a vehicle (unless it was a carefully restored 1969 Ford *Mustang*, of course) with the same age. The answer to this question, and an attempt to dissolve some rather common fears, is in that gleaming paint job.

Simply put, the majority of aircraft operators take far better care of their aircraft than many drivers take care of their vehicles. For most, purchasing an aircraft is a huge monetary investment — in the same ballpark as purchasing a house — and as a result owners are usually pretty apt to keep their birds looking good and running well.

In fact, for the most part, quite a bit of the "care and feeding" that goes into owning a private aircraft is regulated by the FAA. Who is authorized to do maintenance, at what intervals, and to what level of inspection are all carefully laid out in a series of regulations written for the aircraft owners, manufacturers, and maintenance technicians.

Think of it this way: Does anyone really dictate how you take care of your car? Sure, you are *expected* to put new tires on it and get an oil change every once in a while, and some states even make you get an emissions and safety check every year. But realistically, once you have purchased the vehicle its upkeep is largely on you. You could even tinker with the engine if you wanted without having had any formal training! Or, you could never do *anything* to your vehicle and keep on driving.

Not so with aircraft. In order for the airplane to be certificated (and kept that way) an owner has to make sure his or her aircraft meets a certain level of airworthiness. Without that certificate, they don't get to legally fly. So of course pilots want to keep up the standard. In addition, if an aircraft is carefully maintained, the wear and tear isn't as extreme as it is for a vehicle. Naturally it can "live" longer and still perform beautifully. This knowledge alone should make you feel better about those "sexagenarian" aircraft.

Look to the Left

This doesn't mean that things *can't* go wrong, however. For those rare occasions when that "whack!" you hear is actually cause for some concern, it's best to rely on your pilot for visual and auditory cues. Pilots are far more comfortable with the hums and whines of the aircraft so a perplexed, startled, or "uh-oh" look on your aviator's face should give you some inclination that things might not be going as planned. Then you follow up with the question:

"Hey John, are things going as planned?"

Expect an answer and possibly some instructions. Cooler heads prevail in these situations — you want to be an asset to your pilot and not a distraction — so now is the time to listen to what he or she has to say and then be prepared to act.

Hopefully that moment never comes. So sit back, relax, and enjoy the sights (and sounds) of the flight.

Sabrina Woods is an assistant editor for FAA Safety Briefing. *She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.*

TOM HOFFMANN

Sharing the Wealth (of Data)

The Future of Aviation Maintenance Data Exchange

Since 1966, the FAA has collected data on failed aircraft parts and components through its Service Difficulty Reporting (SDR) system. This reporting program has successfully improved safety for aircraft systems and components in the United States and around the world. By providing a communication link between FAA and the aviation community on specific aircraft mechanical issues, SDR enables implementing corrective actions before there is an adverse impact on safety.

Among those contributing data to SDR include front-line mechanics, owners, and pilots, whose vigilant actions and attention to detail during inspections and repairs help assure mechanical reliability. This information is relayed to the SDR database by way of FAA Form 8010-4, Malfunction or Defect Report, commonly known as an SDR. SDR reports should be filed whenever a system, component, or part of an aircraft, powerplant, propeller, or appliance fails to function normally. SDRs are also intended to collect information on flaws that impair a part's proper function.

While paper versions of the form are accepted, FAA encourages the use of the online form available through the Internet Service Difficulty Reporting (iSDR) website (http://av-info.faa.gov/sdrx/). The iSDR site is more convenient to use and also provides a quicker method to report issues and solutions.

However, despite the advent of filing SDRs electronically, the system is still vastly underutilized by general aviation, which only submits information voluntarily. By looking at feedback, the lack of participation in the program is largely explainable. Among the frustrations voiced by users of SDR include it being slow, tedious, and difficult to see the value in their efforts. But the FAA has been listening.

For the past few years, a new system has been in development; one that will radically change the way maintenance data is currently shared and managed. Enter the Aviation Data Exchange, or AVDEX. This new concept-stage system will be simpler to use, more engaging, and will provide a real-time reporting environment with instant feedback and data availability. These capabilities will proactively address and communicate potentially unsafe conditions and in turn help reduce the rate of GA accidents and incidents.

One of the more exciting aspects of AVDEX is its scalability and integration with mobile electronic technology. "Ideally, we'd like to see an IA or mechanic who discovers a mechanical issue take out their smartphone, snap a few photos, and submit it with that same device," says Barry Ballenger, an aerospace engineer at the FAA's Small Airplane Directorate who is also on the AVDEX development team. "We'll also want to have that information made available as real-time as possible so mechanics have useful information in their hands as soon as possible."

Enhanced distribution is another huge selling point for AVDEX. According to Ballenger, users will be able to set up a profile, selecting whatever aircraft or component makes and models they wish to receive updates on. With its planned ability to integrate with other information tools and databases like Special Airworthiness Information Bulletins and Airworthiness Directives, AVDEX will truly become a one-stop shopping system for all types of aircraft and maintenance data. This could be especially helpful with manufacturers that have gone out of business.

Pilots can be beneficiaries of this system too. Knowing what types of issues or problems that could occur with a specific aircraft can help immensely during a preflight inspection. Pilots might also receive an update on their aircraft type right before a flight. They can then choose to consult with a mechanic before deciding whether or not to fly.

"With AVDEX, we're putting critical safety information in the hands of AMTs and pilots, where it counts most, and before the next flight when it counts most," says FAA Aviation Data Systems Branch Manager Bryan Brown. "This system will help them realize that the data they provide really can make a difference."

AVDEX is still in a concept refinement stage, but the FAA is working collaboratively, within the agency and with industry partners, to make the system available. In the meantime, "we still need that data," says Brown, who encourages operators to continue to send reports on mechanical issues through SDR. By submitting SDRs, you provide potentially life-saving data and become integral to preventing accidents.

If you have any questions or need assistance, feel free to email them at 9-AMC-AFS-SDR@faa.gov.

Tom Hoffmann is managing editor of FAA Safety Briefing. He is a commercial pilot and holds an A&P certificate.

Learn More

General Aviation SDR Submission Report
http://av-info.faa.gov/SDRX/SubmissionsGeneralAviation.aspx

Vertically Speaking

RORY RIEGER

Human Powered Helicopter

Finally! After 33 years and dozens of attempts, someone has won the $250,000 Human Powered Helicopter competition.

Back in 1980, the American Helicopter Society established the Igor I. Sikorsky Human Powered Helicopter Challenge and pledged $20,000 to the winner. The requirements were straightforward: fly a human-powered helicopter that could hover continuously for 60 seconds; reach an altitude of at least 3 meters; and remain over a 10 meter horizontal square all on the same flight. Simple as they were, the requirements proved quite daunting, and the effort became one of the more elusive goals in aviation history. In fact, many believed them to be unachievable. However, last summer, AeroVelo, an aeronautical engineering team sponsored by the University of Toronto, did achieve the impossible by designing, building and flying Atlas, a rotorcraft that met all the requirements and captured the prize money (adjusted in 2009 because of inflation and the difficulty of the effort). Congratulations!

I don't want to reveal my age, but I was involved in this venture during the relatively early years of the Challenge. I was an engineering student at The University of Texas at Austin, and I chose this particular endeavor as my senior year design project. No one expected a group of engineering undergrads to accomplish the feat, especially given the constraints of a one semester college course. Rather, the plan was to review what work had been done by previous teams, build on that experience, and then hand off the project to the next class. Nevertheless, obstinate and naïve as college students often are, our team plunged headlong into the effort, thinking that maybe, just maybe, we could pull it off and become heroes, at least within the aerospace department and, of course, perhaps with some co-eds, too.

As with any project, research comes first, and we promptly found out that Leonardo da Vinci was the one of the first individuals to envision such a craft but had been unsuccessful in building one. Since someone of da Vinci's caliber was thwarted, keeping the team focused and positive was going to be difficult. Intended as a shot in the arm to our waning enthusiasm, we watched a documentary film of a team that had already built a helicopter and performed some test flights. The film was professionally done for television and had Peter Graves, the late actor of Mission Impossible fame, as its narrator. This led to a running joke about how ironic and possibly even prophetic it was for the documentary to be narrated by someone associated with a TV series of that name. But we pressed on.

Our first engineering thought was that a traditional tail rotor was out of the question. Tail rotors on helicopters are designed to counter the torque produced by the main lifting rotor and typically do not provide any lift at all. With a human as our power source, it was clear that his energy had to be transferred as much as possible into generating lift and none into counteracting his own effort. Traditional tail rotors require energy amounts that are best left to turboshaft engines and jet propellant fuel. Obviously, tandem rotors, such as that on Chinook helicopters, were one solution, but we eventually settled on placing propellers on the ends of the rotor blades to drive the blades without the need for anti-torque measures. To this day, although AeroVelo used multiple main rotors, I believe that this approach was our cleverest idea of the whole semester.

Our next best idea was to dedicate a team member as an engine expert. While this at first might seem strange for such a project, his job was to recruit a world class cyclist, get smart on nutrition and training, and have someone prepared to "fly" the rotorcraft once built. Incidentally, this makes AeroVelo's success even that much more impressive, as it was the team's leader who pedaled the aircraft into the history books, not some Tour de France champion.

We had other clever ideas I'm sure, but they are now lost from my memory. Needless to say, we did not achieve the challenge. However, as time passed, I realized that the journey was the goal and not necessarily success. The aerospace department and our professor knew that team building, brainstorming, and yes, final reports and grades, were what our senior project was really all about. Still, I'll always wish just a little bit that our team could be the one mentioned in the same sentence as da Vinci. Congratulations, indeed, AeroVelo!

Rory L. Rieger is an aerospace certification engineer for the Rotorcraft Directorate. He has served as a fixed- and rotary-wing pilot for the U.S. Navy and Navy Reserve for 28 years. His career has included duty in more than 20 combat operations.

Flight Forum

Back in the Saddle Again

Thanks for an excellent publication! I just read "Getting Back in the Game" (March/April 2014 edition) and will use a lot of what I learned to get back after years of wishing I was in the air. In five years, technology and the airspace system has changed so much that in order to be a safe and prudent pilot, it is best to review all of the regulations and get a few hours to become proficient — not just to become legal again. Keep up the excellent work.

— Luis

We are pleased you found the edition so useful and we couldn't agree more with your comment about logging a few hours to become proficient again. Your local CFI misses you and will be glad to see you back in the "saddle."

Sucked Me In

You all did a fine job on [the January/February 2014] issue of FAA Safety Briefing. I saw an article that caught my interest and ended up reading them all! Chock full of good information and an abundance of links to associated sites, it was like being a kid in a candy shop. After forwarding three articles in a row to my son, who is a budding aviator, I finally sent him a note to read all of the articles! Congratulations on a job well done.

—Darryl

Excellent! Aviation technology is a fast moving field and it is easy to get a little left behind if you are not constantly reading up on what is the "latest and greatest." This edition was our chance to help catch our readers back up while pointing out some of the pertinent safety aspects of these new gadgets.

Shortest Distance Between Two Points ...

The link to the SAFE site for "Maintaining Aircraft Control" on page 27 (March/April 2014 edition) is to the home page. Instead of www.safe.org, try http://www.safepilots.org/documents/Maintaining_Aircraft_Control_20Jun2012.pdf to view the actual document.

— Gerry

Thank you so much for catching that. We certainly want our readers to be able to easily access this beneficial document and appreciate you submitting the direct link.

Flying Abroad

I am a U.S. Citizen and FAA Certificated Flight Instructor. I recently moved to Madrid from Miami. According to the Spanish EASA authorities I cannot provide flight training towards an FAA certificate in the Kingdom of Spain, not even in an N-registered aircraft, unless I hold both FAA and EASA Flight Instructor Certificates. I would like to know if this rule is reciprocal.

— Gonzalo

In accordance with 14 CFR part 61.3, one may provide flight training towards an FAA certificate from the European Union towards an American certificate in a U.S. registered aircraft. However, we requested an explanation from the European Aviation Safety Agency (EASA) regarding their flight training requirements with the European Union (EU) and according to Basic Regulation (Regulation (EC) No. 216/2008) Articles 4 and 7, if a pilot is residing in the European Community and flying an N-registered aircraft, he or she needs to have a relevant Part-FCL license, Part-FCL rating/s, Part-FCL instructor certificate/s and part medical or validation issued by a corresponding National Aviation Authority. In your case since the validation of instructor certificates is limited (see Annex III to Regulation Aircrew) the validation is not an option.

FAA Safety Briefing welcomes comments. We may edit letters for style and/or length. If we have more than one letter on a topic, we will select a representative letter to publish. Because of publishing schedule, responses may not appear for several issues. While we do not print anonymous letters, we will withhold names or send personal replies upon request. If you have a concern with an immediate FAA operational issue, contact your local Flight Standards District Office or air traffic facility. Send letters to: Editor, FAA Safety Briefing, AFS-805, 800 Independence Avenue, SW, Washington, DC 20591, or email SafetyBriefing@faa.gov.

Let us hear from you — comments, suggestions, and questions: email SafetyBriefing@faa.gov or use a smartphone QR reader to go "VFR-direct" to our mailbox.

SUSAN PARSON

What's the "Big Deal?"

I don't imagine aviation is unique in that there is a great divide between the "haves" and "have nots," — and I'm not talking about having either airplanes, or money. It's about having passion for the activity or, more accurately, the lifestyle.

On the one hand are those who have a passion for aviation. I suspect most regular readers of this magazine fall in that category. Some of us may think it has always been this way as we can't remember a time when we didn't yearn for the sky, while others can recall a specific time or circumstance that led them to discover the joy of flying.

On the other hand are those who find themselves puzzled by pilots' passion. They just don't "get it," and they are even more baffled (or downright frustrated) when a pilot responds with "whaddya mean you don't get it — how can you *not* understand?" Yes, I too have been guilty of that reaction. I'd like to think I've managed to conceal it, but I'm sure I've been less than completely successful.

If you are a pilot seeking to explain the joy of flying, or a pilot's companion seeking to better understand, I highly recommend acquiring a copy of Bach's *Gift of Wings*.

The fact of the matter is that there is absolutely nothing wrong with being passionate about aviation. Neither is there anything wrong with being indifferent to it. But as many of us have seen this divide can pose problems with people in those "have/have not" relationships. There may not be anything either person can do to change the fundamental situation but it could be helpful if the pilot could better convey why aviation *is* such a big deal to people who just don't seem to understand.

Bach to the Rescue

Enter Richard Bach. Though Bach is best known as the author of *Jonathan Livingston Seagull*, regular readers of this column know that I am a fervent fan of his aviation writing. I cannot think of any writer who better conveys the science, the art, the poetry, the beauty, and the mystery of flying. So, if you are a pilot seeking to explain these things, or a pilot's companion seeking to better understand, I highly recommend acquiring a copy of Bach's *Gift of Wings*. In the meantime allow me to point to a few of my favorites from this small volume of essays.

Perhaps my very favorite piece in the entire Bach canon is an essay called "Why You Need An Airplane... and How to Get It." No other author I know has even come close to matching this essay's ability to describe the "principle of the sky, a spirit of flight that calls to certain among mankind as the wilderness calls to some and the sea to others." Bach goes on to note that for those who discover this principle; "(f)light, to you, is a required essential tool in your mission of becoming a human being."

Another favorite is a slightly mysterious essay called "Steel, Aluminum, Nuts, and Bolts." From the very first sentence, the narrator is this tale staunchly maintains that "an airplane is a machine. It is not possible for it to be alive. Nor is it possible for it to wish or to hope or to hate or to love." He goes on to say that regardless of our fanciful notions, "there is no sentence, no word, no hint in any technical manual ever printed that even remotely says that this machine's performance can possibly change because of a pilot's hopes or his dreams, or his kindness to his airplane." And yet ...? Ah but I won't spoil the story for you. The ambiguous conclusion does nothing to dispel most pilots' belief that an airplane is much more than just a collection of steel, aluminum, nuts, and bolts.

Then there is "Return of a Lost Pilot" — the lovely story of a lapsed pilot who regains his long-faded passion for life by returning to the sky; "He doesn't have to use a lot of words. He can communicate through flying." And in the end, "my friend ... who had been dead himself for so long, was flying. He was alive again."

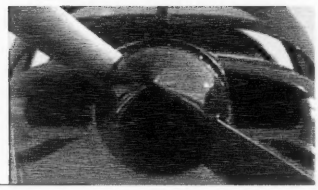
On a similar note — and one fitting close to this special pilot companion themed issue of *FAA Safety Briefing* — is Bach's "Girl from A Long Time Ago." A pilot takes his spouse flying, and then worries that the discomfort of the open-cockpit biplane will worsen her indifference to his particular passion. She reaches for a pencil to write a message — the only way to communicate in the circumstances — and he fully expects to see "let's quit" when she hands him it. He takes it with trepidation, and reads its single word; "FUN! with a little laughing face drawn alongside."

Fun indeed. May you and yours share and savor every moment of the fun, the adventure, the art, and the beauty of the Very Big Deal called flying.

Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. She is an active general aviation pilot and flight instructor.

PAUL CIANCIOLO

FAA Faces



Susan Williams

Deputy Program Manager, Office of Information Technology's Integrated Service Center

Susan Williams and husband J.B. Williams, the pilot and ASI with the FAASTeam, in front of their homebuilt Van's RV-6A airplane.

"There is nothing more important than arriving at your destination safely," explains Susan Williams, who works in the FAA's Office of Information Technology. "Don't try to beat the weather or keep flying on that partial tank of fuel. Don't skip the preflight check because you're in a hurry. Don't assume you know the checklists; read them each and every time. Use flight following as much as possible. And finally, notify a friend or family member just before takeoff as well as when you're back on the ground."

These may sound like the typical musings of a seasoned instructor, but Susan is not a pilot nor has she had any pilot training. She is a professional cockpit companion — flying right-seat with her pilot husband.

Susan's first experience with general aviation (GA) was when she was nine years old. She flew on a harrowing flight through a rainstorm while in the back — behind the seats — of a two-seat airplane of a family friend returning home.

"Because I was a nine-year-old, I probably wouldn't have questioned the adult pilot. That being said, I can definitively say that the pilot transporting me in the back of the airplane with no seats was very unsafe, not to mention the questionable weather."

Susan may have been too young to speak up at the time, but every passenger has a right to question the pilot if something doesn't seem right. Seatbelts are required for all occupants with very few exceptions (see 14 CFR section 91.107). Checking the seatbelts is even on the pilot's checklist.

If you are sitting right-seat, Susan believes it a good idea to participate in going through the checklists. "It is my job to read through the checklists."

When Susan flies with her husband, she also pays attention to the radio communications with air traffic control (ATC). Two sets of ears are always better than one!

"When ATC indicates that traffic is nearby, I try to assist in looking for the traffic."

A pilot training course for the non-pilot is also a good idea if you often find yourself a cockpit companion. Calling for help on the radio and being able to land in an emergency is a skill that you really can (and should want to) learn.

Susan's experience working for the FAA does give her quite a bit of useful aviation knowledge. Her FAA career started in 1991, when she transferred from the Internal Revenue Service to work as an aviation safety assistant at the Fresno Flight Standards District Office (FSDO) in California. In 2000, she was promoted to an aviation safety technician, a job that included hands-on regulatory and certification work. She attended safety courses, including accident investigation, and assisted aviation safety inspectors (ASIs) with certification and surveillance tasks.

The next year, Susan switched gears and became a computer assistant. She later worked as a SharePoint team member, acting section manager, and Business Coordination and Internet Services team lead.

"Along with all of the FAA's computer specialists, I was realigned into the Office of Information Technology (AIT) in October 2013. I am currently detailed into the Integrated Service Center (ISC) Branch, where I am serving as the deputy program manager."

The purpose of the ISC program is to develop the future FAA Service Center, which will be a one-stop shop for IT services and support that will focus on improving customer service to FAA employees.

"My experience in the FAA has exposed me to the details of numerous aircraft accidents. I am always amazed when I hear about pilots who disregard things like bad weather or fuel quantity."

Notwithstanding the turbulent childhood ride as "cargo," Susan does love flying and she feels very confident when her husband is at the controls. "He's very safety conscious, and has the training, skills, and experience of a life-long aviator. He absolutely loves flying, he loves our airplane, and he loves me — so I completely trust him to keep us all safe."

It's what every cockpit companion should hope for.

Paul Cianciolo is an assistant editor and the social media lead for FAA Safety Briefing. *He is a U.S. Air Force veteran, and a rated aircrew member and search and rescue team leader with the Civil Air Patrol.*

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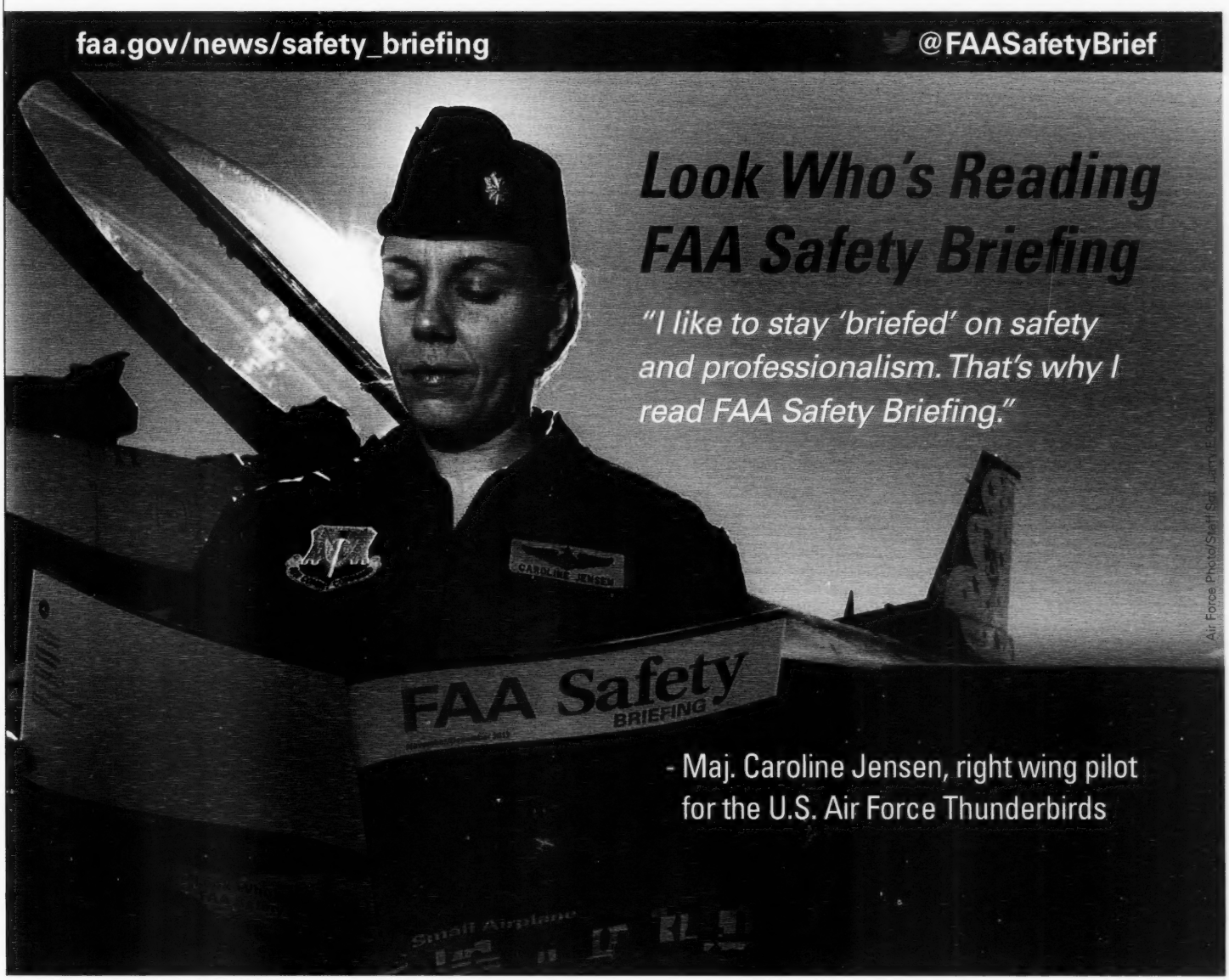
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